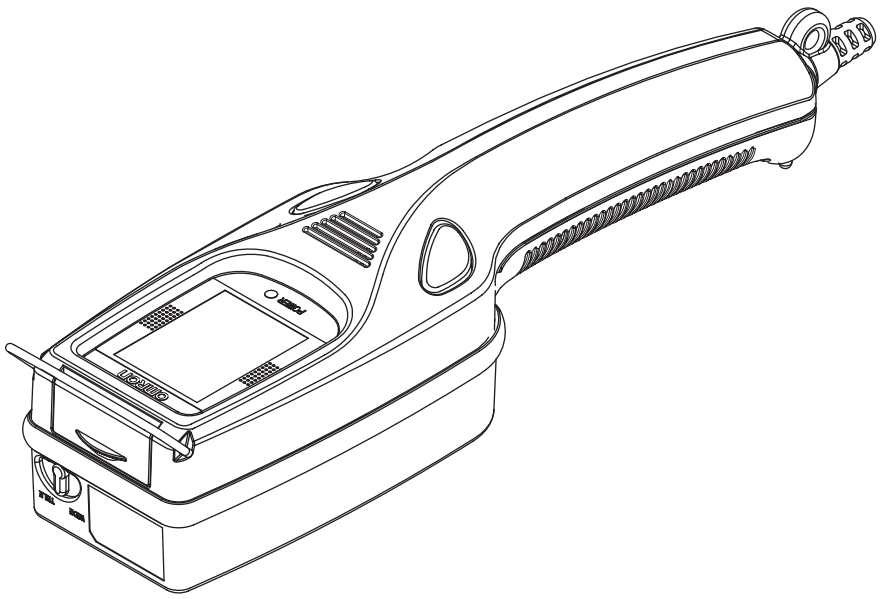
OMRON

Handheld
2D Code Reader

V400-H111/211

User's Manual



Cat. No. Z228-E1-02

Introduction

Thank you for purchasing the OMRON V400-H111/H211.
This manual describes the functions, performance, and application methods of the V400-H111/H211.

This manual is intended for personnel with knowledge of electrical systems. Be sure to read and understand this manual thoroughly before using the product, and keep this manual in an easily accessible location for quick reference when required.

Introduction	Application Considerations (Read and understand this information first.)
Section 1	Product Overview
Section 2	Installation and Connections
Section 3	Reading 2D Code
Section 4	System Settings
Section 5	Troubleshooting
Appendices	Specifications and Dimensions

Handheld 2D Code Reader
User's Manual

V400-H111/211

READ AND UNDERSTAND THIS DOCUMENT

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

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OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.

- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.
NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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Performance data given in this document is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

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Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

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Meanings of Signal Words

In this manual, precautions are indicated using the following symbols and signal words to ensure safe use of the V400-H111/211. The precautions indicated by these symbols and signal words are important for safety and must be observed.

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

Meanings of Alert Symbols

	Indicates the possibility of explosion under specific conditions.
	Indicates general prohibitions for which there is no specific symbol.

Alert Statements in this Manual

⚠WARNING

This product is not designed or rated for ensuring safety of persons.
Do not use it for such purposes.

A lithium battery is built into the Controller and may occasionally combust, explode, or burn if not treated properly.
Dispose of the Controller as industrial waste, and never disassemble, apply pressure that would deform, heat to 100 °C or higher, or incinerate the Controller.

Regulations and Standards

The V400-H111/211 complies with the international regulations and standards listed below.

EC Directives	EMC Directive:No.89/336/EEC
EN Standards (European Standards)	EN61326: 1997, +A1: 1998 +A2: 2001 (EMI: Class A) Power line: 10 m max. Signal line: 30 m max.

Precautions for Safe Use

Observe the following precautions to ensure safe use of the product.

■ Installation Environment Precautions

- Do not use the product in environments with flammable or explosive gases.
- Do not install outdoors.

■ Power Supply and Wiring Precautions

- Use the product with the power supply voltages specified in this manual.
- Use the cables specified in this manual.
- Keep the power supply cable as short as possible (10 m maximum).
- Use a DC power supply with countermeasures against high-voltage spikes (safe extra low-voltage circuits on the secondary side).

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■ Other Precautions

- Do not attempt to disassemble, repair, or modify the product. Doing so may cause product failure or a fire.
- If the product becomes extremely hot, or abnormal odors or smoke occurs, stop using the product immediately, turn OFF the power, and consult with your OMRON representative.
- Dispose of the product as industrial waste.
- Do not apply pressure or deform the product when disposing of it.

Precautions for Correct Use

Always observe the following precautions to prevent operation failures, malfunctions, and adverse effects on performance and equipment.

■ Operating Environment

Do not install the product in the following locations:

- Locations subject to ambient temperature that exceeds the rated temperature range
- Locations subject to rapid changes in temperature (causing condensation)
- Locations subject to relative humidity that exceeds the rated humidity range
- Locations subject to corrosive or flammable gases
- Locations subject to dust, salt, or metallic powder
- Locations subject to direct vibration or shock outside the specified ranges
- Locations subject to direct sunlight
- Locations subject to oil or chemical spray

■ Installation and Handling of Components

- Use the cables specified in this manual.

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■ Connecting and Removing Cables

- Do not connect a cable to the Handheld 2D Code Reader if the other end of the cable is connected to a personal computer or a Programmable Controller.
- To prevent damage from static electricity, use a wrist strap or another device for preventing electrostatic charges when touching terminals or signal lines inside connectors.

■ Memory Cards

- Do not remove the Memory Card when the Memory Card indicator is lit. Doing so may result in damage to the Memory Card or the Handheld 2D Code Reader.
- OMRON shall not be responsible in any way for damage or loss of Memory Card data as a result of mishandling.

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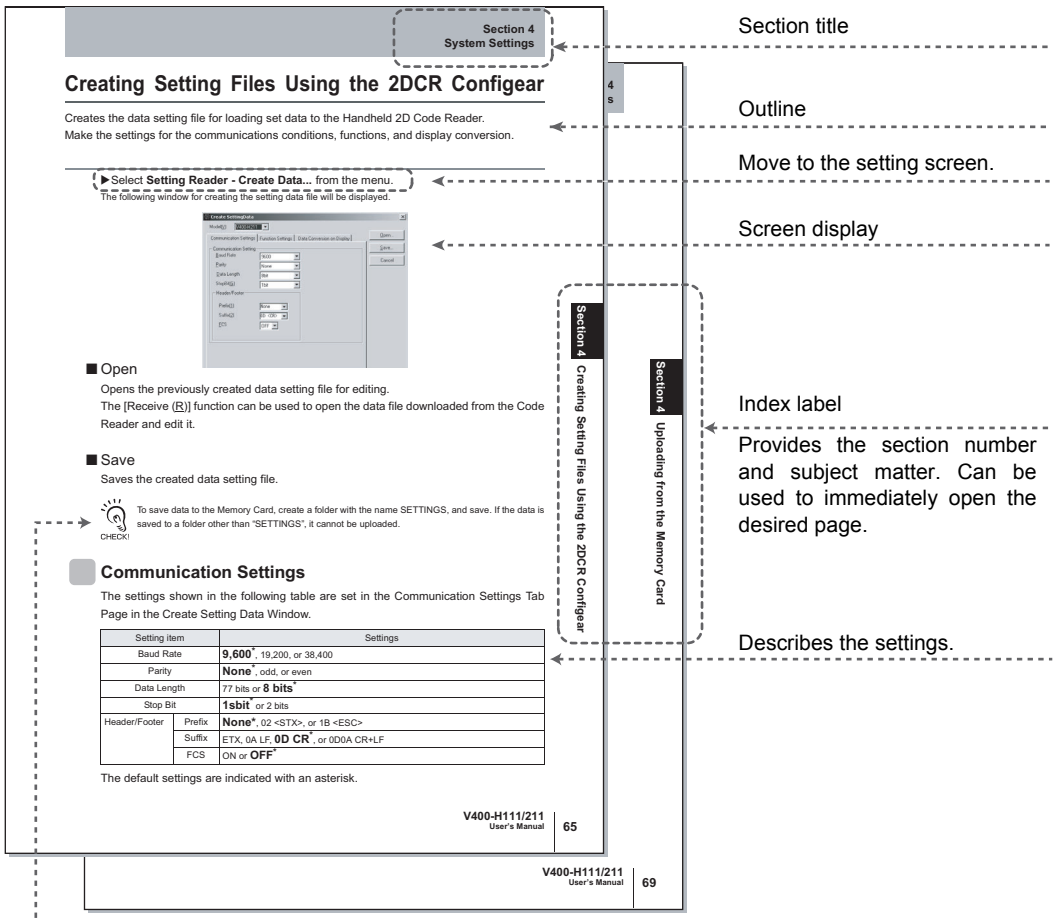
■ Turning OFF the Power Supply

- Do not turn OFF the power supply while a message is being displayed indicating that processing is being performed. Data in memory will be destroyed, and the product may not operate correctly the next time it is started.

How to Use This Manual

Page Format


Section 4
System Settings
Creating Setting Files Using the 2DCR Configear
Creates the data setting file for loading set data to the Handheld 2D Code Reader.
Make the settings for the communications conditions, functions, and display conversion.
▶Select Setting Reader - Create Data... from the menu.
The following window for creating the setting data file will be displayed.
■ Open
Opens the previously created data setting file for editing.
The [Receive (R)] function can be used to open the data file downloaded from the Code Reader and edit it.
■ Save
Saves the created data setting file.
To save data to the Memory Card, create a folder with the name SETTINGS, and save. If the data is saved to a folder other than "SETTINGS", it cannot be uploaded.
CHECK!
Communication Settings
The settings shown in the following table are set in the Communication Settings Tab Page in the Create Setting Data Window.
Setting item
Settings
Baud Rate
9,600*, 19,200, or 38,400
Parity
None*, odd, or even
Data Length
7 bits or 8 bits*
Stop Bit
1sbit* or 2 bits
Header/Footer
Prefix
None*, 02 <STX>, or 1B <ESC>
Suffix
ETX, 0A LF, 0D CR*, or 0D0A CR+LF
FCS
ON or OFF*
The default settings are indicated with an asterisk.
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Section 4
Creating Setting Files Using the 2DCR Configear
Section 4
Uploading from the Memory Card
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Section title
Outline
Move to the setting screen.
Screen display
Index label
Provides the section number and subject matter. Can be used to immediately open the desired page.
Describes the settings.
Procedure and additional explanations

Information useful during the operation and reference pages are provided here with special marks to indicate the kind of information being provided.

*This page does not actually exist in this manual.

Visual Aids

Indicates points that are important in using product functions or in application procedures.

Indicates page numbers providing related information.

Indicates helpful information when a problem occurs and explanations of technical terms.

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Section 1
Product Overview

This section provides an introduction to the Handheld 2D Code Reader's features, functions, basic configuration, and operation flow.

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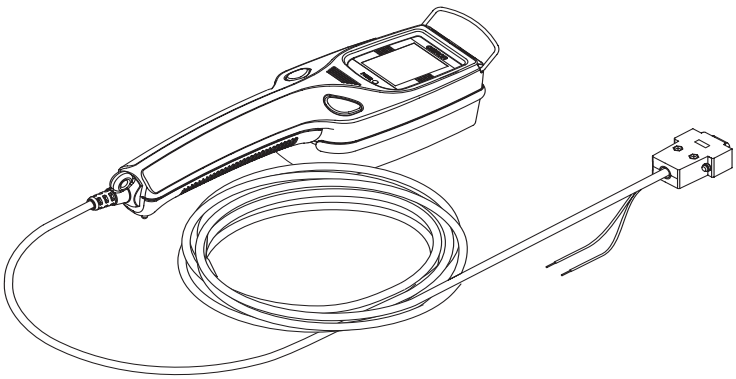
Features



The 2D Code Reader is designed to read two-dimensional code. A built-in monitor and zoom lens are ideal for reading directly marked 2D code.
A Memory Card Slot is also provided along with a range of useful functions.

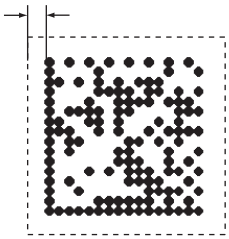
Readable Codes

Readable codes	DataMatrix	QR Code
Readable sizes (symbol size)	• ECC200 10 × 10 to 64 × 64 8 × 18 to 16 × 48	• Model 1 or 2 21 × 21 to 57 × 57 (Version 1 to Version 10)

CHECK!

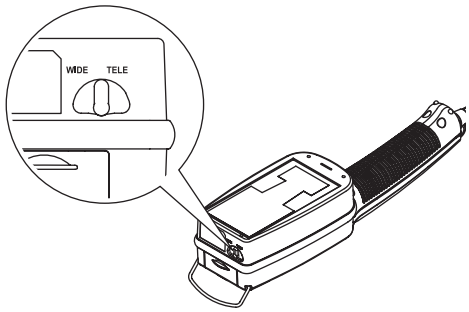
DataMatrix and QR Code Margins
All 2-dimensional codes must be surrounded by a margin. Provide a margin that is at least one cell in size for both DataMatrix and QR Codes.

Margin: 1 cell min.



Zoom Lens (Manual)

The zoom lever can be used to change the field of view, enabling a variety of applications with a single Unit. Two lens variations provide wide-angle and telescopic views, covering all viewing needs from paper level to complicated code.

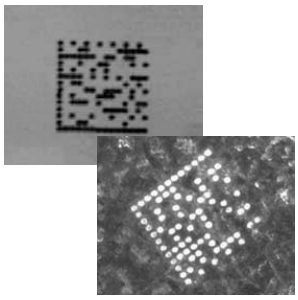


Dual System Lighting

Coaxial lighting and oblique lighting are provided in a single Unit. The type of the lighting is automatically selected.

- V400-H111: RGB 3 color coaxial, red oblique lighting
- V400-H211: Red coaxial, red oblique lighting

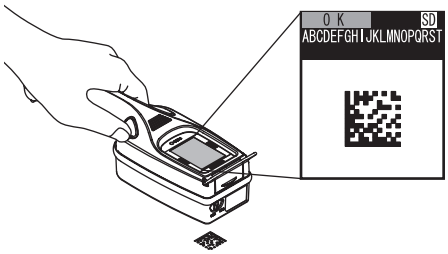
Workpieces with different optical characteristics can be read with a single Unit, and workpieces with a range of direct markings can also be read.



Liquid Crystal Display

A 1.8-inch liquid crystal monitor is provided to enable alignment when reading while observing the image.

The Handheld 2D Code Reader enables confirmation of read data and images, previously not possible with handheld readers.



Memory Card Slot

A Memory Card slot is provided to back up settings on Memory Cards and upload data from Memory Cards.

A function is also provided for saving 2D code data that was read as files in the Memory Card.

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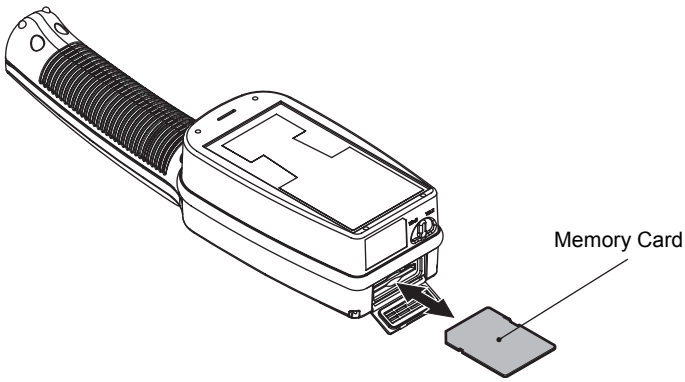

Useful Functions

■ Data Conversion on Display

This function converts data that is read and displays it as a separate text string.

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■ Data Accumulation

This function writes data that is read to the Memory Card.

p.65

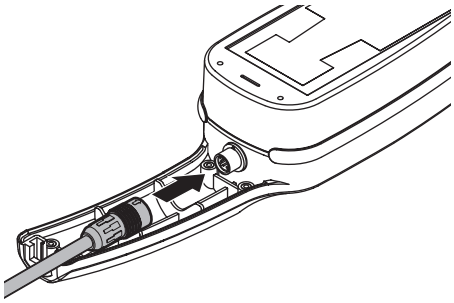
Operation Overview

Installation and Connections Section 2 p.17

Prepare the required components and connect them.

Main Peripheral Devices

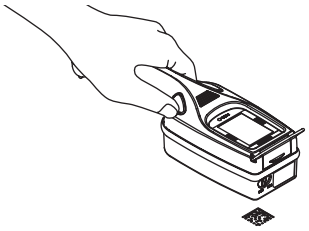
- Cable
- Power supply device
- Contactor



Reading 2D Code Section 3 p.35

Turn ON the power and press the trigger buttons to read the code.

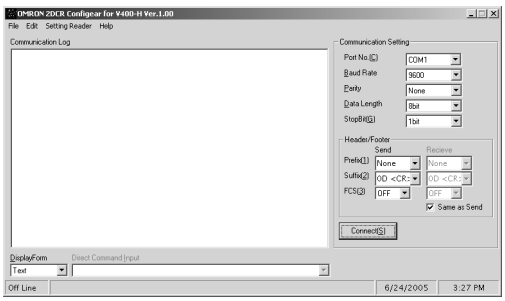
- Reading method
- Field of view setting
- Display details



System Settings Section 4 p.43

Basically, no settings are required. However, in the following cases, the settings may need to be changed using the Setup window of the Code Reader or the special tool [2DCR Configear].

- To change the communication conditions (See note.)
- To use various functions



If [2DCR Configear] is used, the changes you have made will be reflected to the Code Reader using the Memory Card or the communication function of [2DCR Configear].

*1 The default settings are as follows: Baud rate: 9,600 bps; Parity: None; Data length: 8 bits; Stop bits: 1 bit

MEMO

Section 2
Installation and Connections

This section describes the methods used to connect cables and perform other installation procedures and connections.

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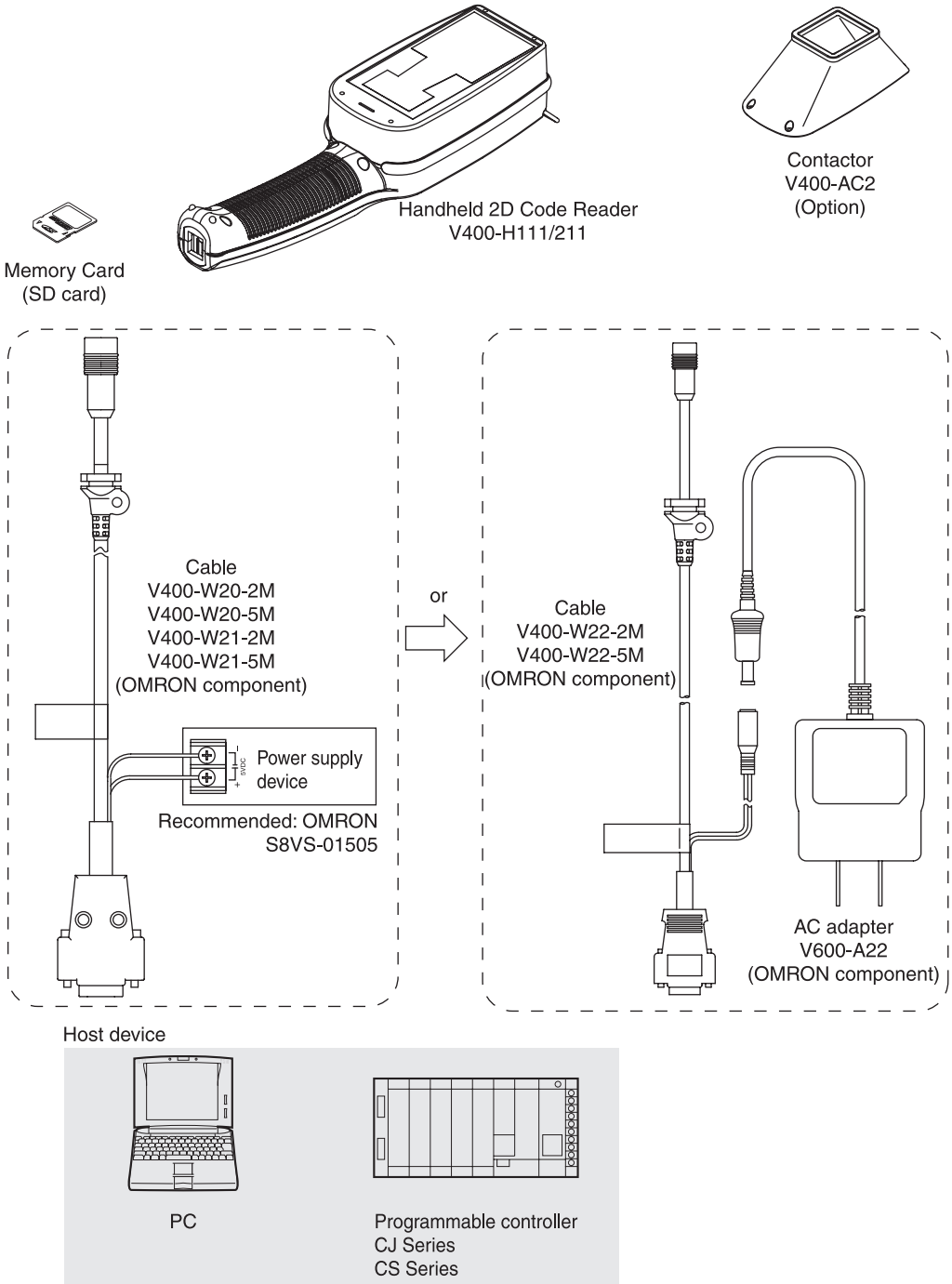
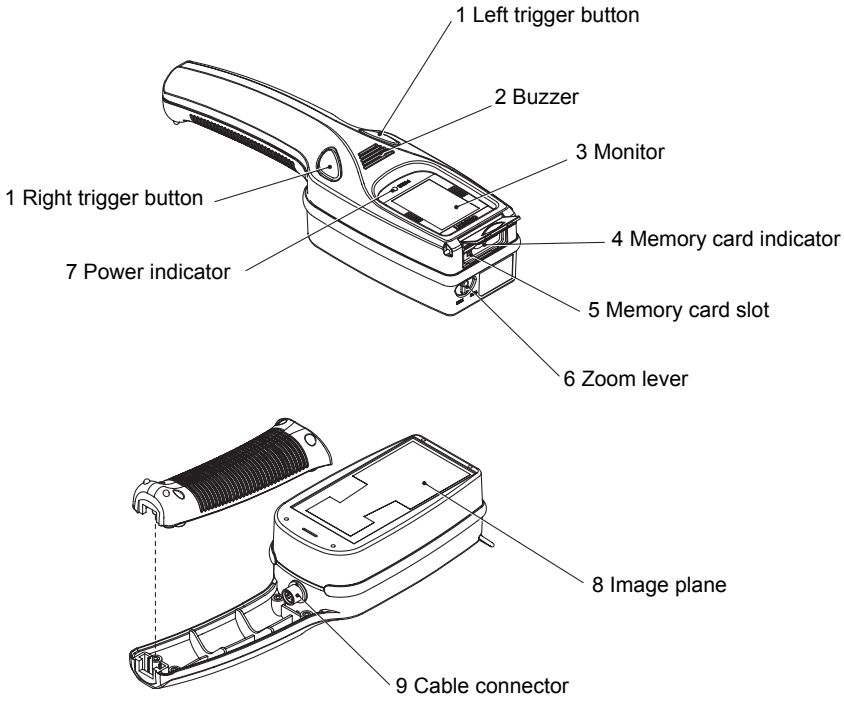
Basic System Configuration

The basic system configuration is shown in the following diagram.



Component Names and Functions

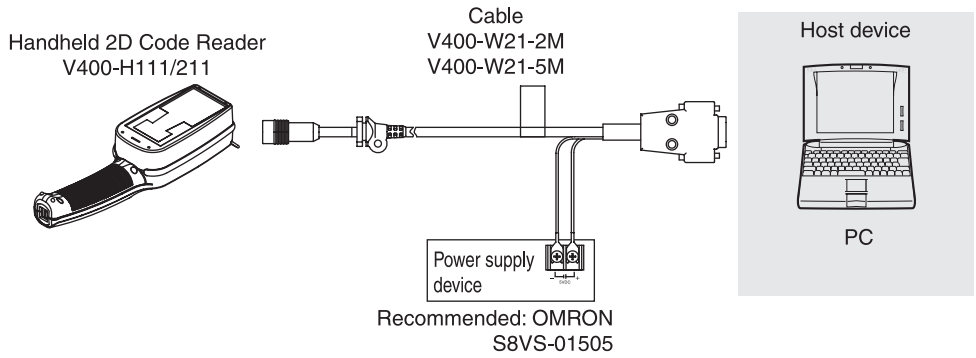


Name	Details
1 Trigger buttons (Right, Left)	Inputs a trigger, cancels sleep state or when setting mode is entered. p.38
2 Buzzer	A high- or low-tone buzzer sounds depending on the operation. p.37
3 Monitor	Displays the read image/results, and other data. p.39
4 Memory card indicator	Lit while the Memory Card is being accessed. (Do not remove the Memory Card if the indicator is lit.) p.41
5 Memory card slot	Slot for inserting Memory Card.
6 Zoom lever	Changes the field of view.
7 Power indicator	Lit when power is first turned ON and remains lit during operation. p.41
8 Image plane	Camera image plane
9 Cable connector	Connects to a cable (V400-W20-2M/5M, V400-W21-2M/5M, V400-W22-2M/5M). p.23

Cable

The Cables are specifically designed for the V400. Using other Cables may damage the devices.

Connecting a Personal Computer (V400-W21-2M/5M Cable)



- Connector

The connector used for V400-W21-2M and V400-W21-5M Cables is a D-sub, 9-pin connector (female).

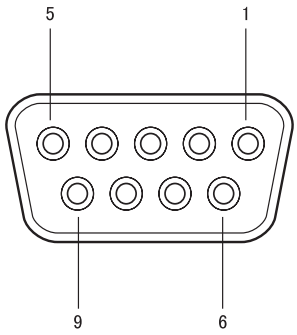
The connector is compatible with the connection port on the IBM PC/AT or compatible.

2D code reader V400-H111/211 Special round connector
Name
SD
RD
SG
+5 V

IBM PC/AT or compatible D-sub, 9-pin	
Name	Pin No.
-	1
RD	2
SD	3
ER	4
SG	5
DR	6
RS	7
CS	8
-	9
Shield wire	Connector cover

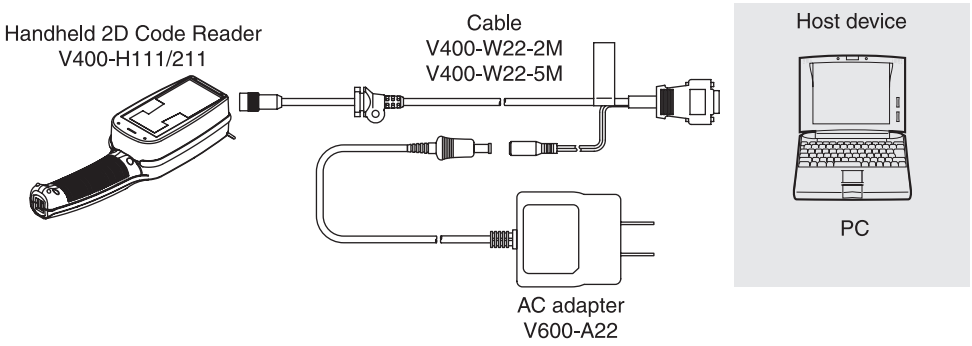
0 V

+5 V



(View of mating section)

Connecting a Personal Computer (V400-W22-2M/5M Cable)



- Connector

The connector used for V400-W22-2M and V400-W22-5M cables is a D-sub 9-pin connector (female).

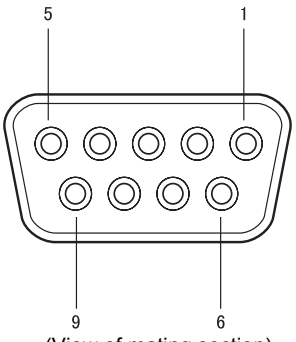
The connector is compatible with the connection port on the IBM PC/AT or compatible.

2D code reader V400-H111/211 Special round connector	
Name	
SD	
RD	
SG	
+5 V	

IBM PC/AT or compatible D-sub, 9-pin	
Name	Pin No.
-	1
RD	2
SD	3
ER	4
SG	5
DR	6
RS	7
CS	8
-	9
Shield wire	Connector cover

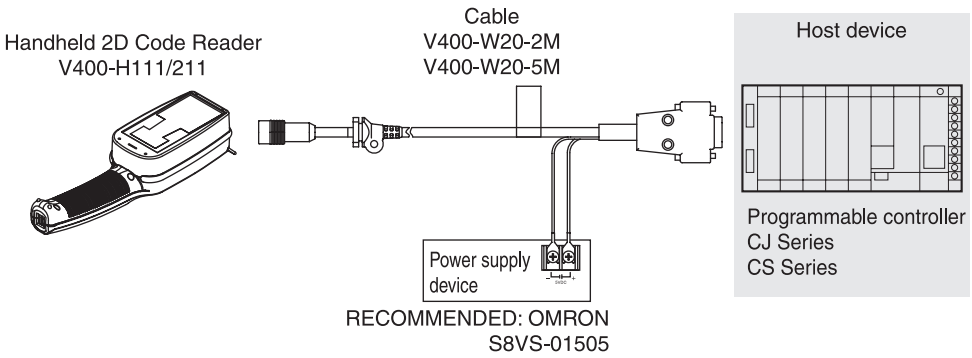
0 V

+5 V



(View of mating section)

Connecting a Programmable Controller (V400-W20-2M/5M Cable)



• Connector

The connector used for V400-W20-2M and V400-W20-5M Cables is a D-sub, 9-pin connector (male).

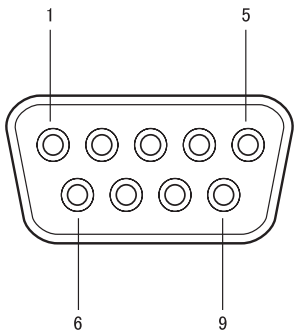
The connector is compatible with the connection port on OMRON CJ-series and CS-series Programmable Controller.

2D code reader V400-H111/211 Special round connector	
Name	
SD	
RD	
SG	
+5 V	

Programmable Controller D-sub, 9-pin	
Name	Pin No.
-	1
SD	2
RD	3
RS	4
CS	5
-	6
-	7
-	8
SG	9
Shield wire	Connector cover

0 V

+5 V



(View of mating section)

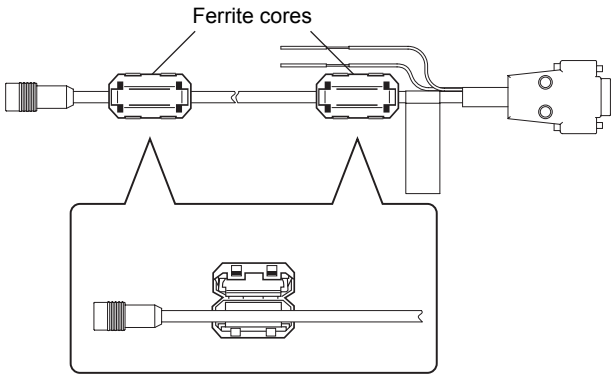
Connecting Cables to the Handheld 2D Code Reader

CHECK!

Connect one end of the cable to a personal computer or Programmable Controller before connecting the other end of the cable to the Handheld 2D Code Reader.

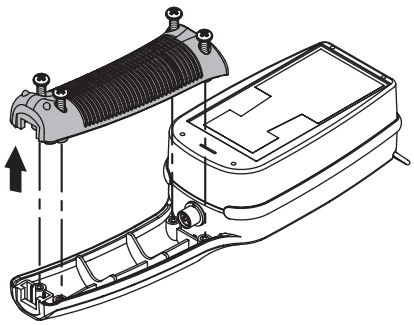
1. Attach the provided ferrite cores to the cable.

Attach the ferrite cores in two locations; one at the Handheld 2D Code Reader end of the cable, and the other at the host device end of the cable.
Close the ferrite cores until a click is heard. Separate from the power lines.



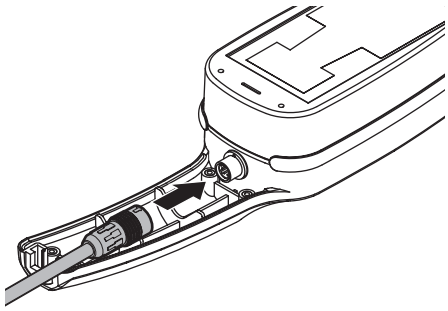
2. Remove the cover from the Code Reader.

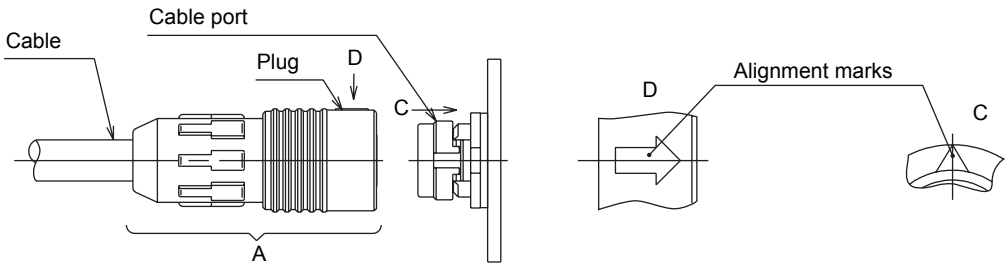
Loosen the four screws to detach the cover.



3. Connect the cable.

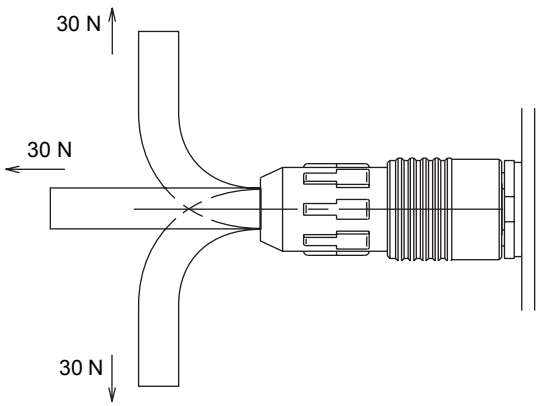
Grasp the cable plug (part A). Line up the alignment mark on the plug with the alignment mark on the Handheld 2D Code Reader connector and push the plug in straight.



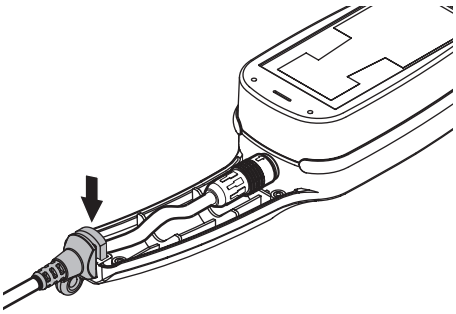


CHECK!

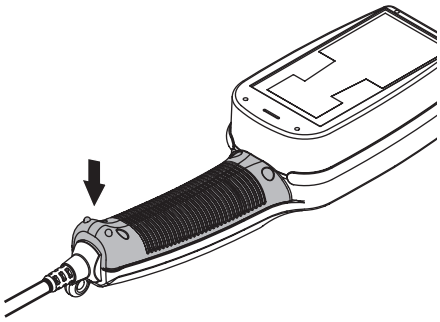
Use a force of no more than 15 to 20 N to plug in the connector.
Pull gently on the cable (approximately 10 N) to make sure the connector is securely connected. After the connector is plugged in, do not apply a force of more than 30 N to the connector in the following directions. Excessive force will damage the connector.



4. Fit the bush into the slot on the case.



5. Attach the cover and secure it with the four screws.



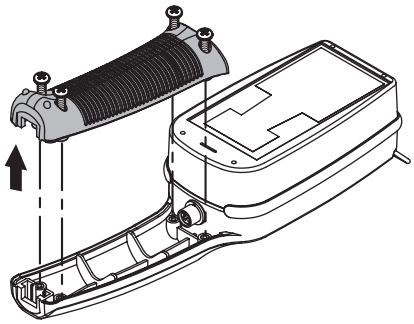
Disconnecting the Cable from the Handheld 2D Code Reader

1. Disconnect the cable connector from the host device.

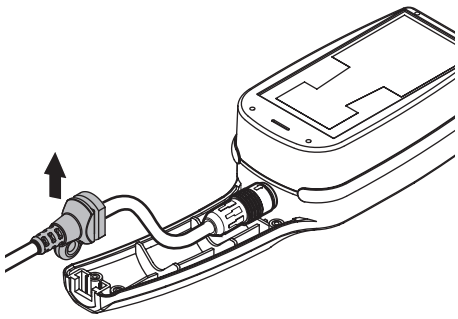
p.28

2. Remove the cover from the Code Reader.

Remove the four screws to detach the cover.

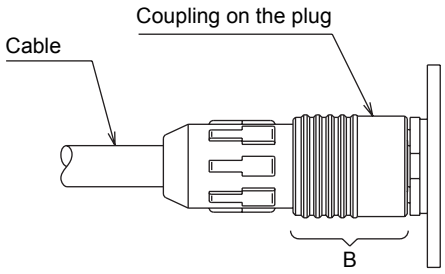


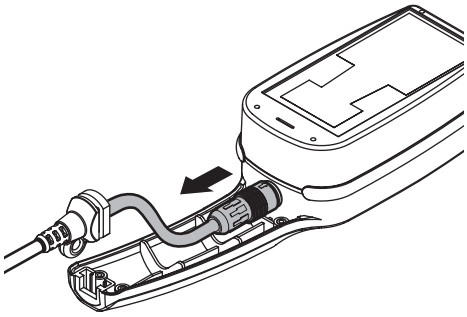
3. Remove the bush from the slot on the case.



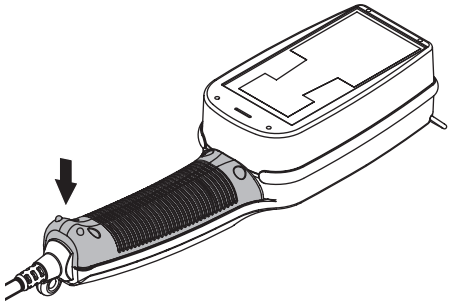
4. Disconnect the cable.

Grasp the coupling (part B) on the plug and pull the plug out straight as shown in the diagram below.





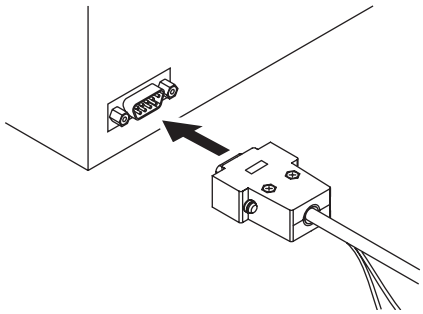
5. Attach the cover and secure it with the four screws.



Connecting the Cable to the Host Device

1. Connect the cable connector to the RS-232C interface on the host device.

Make sure that the connector is oriented correctly and not inserted at an angle. Secure the connector using the screws on both sides of the connector.



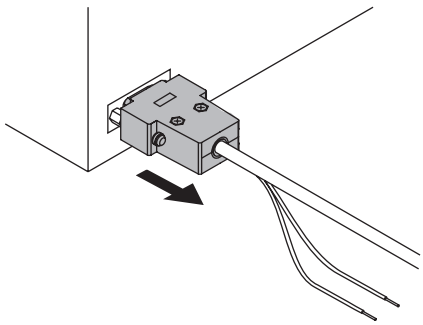
Removing the Cable from the Host Device

1. Remove the cable.

Loosen the screws on both sides of the connector and pull the connector out straight.

CHECK!

Loosen the screws sufficiently on both sides of the connector to remove it. Do not remove the connector by force.



Power Supply

Power must be supplied to the V400-H111/211 via the cable.
Wire the power supply independently of other devices. In particular, keep the power supply wired separately from inductive loads.

CHECK!

Use a DC power supply with safe extra-low-voltage circuits to prevent high voltage. If UL recognition is required for the overall system, use a UL Class II DC power supply.

Connecting the Power Supply (V400-W21-2M/5M, V400-W20-2M/5M)

Use a power supply that meets the following requirements.

Power Supply Requirements

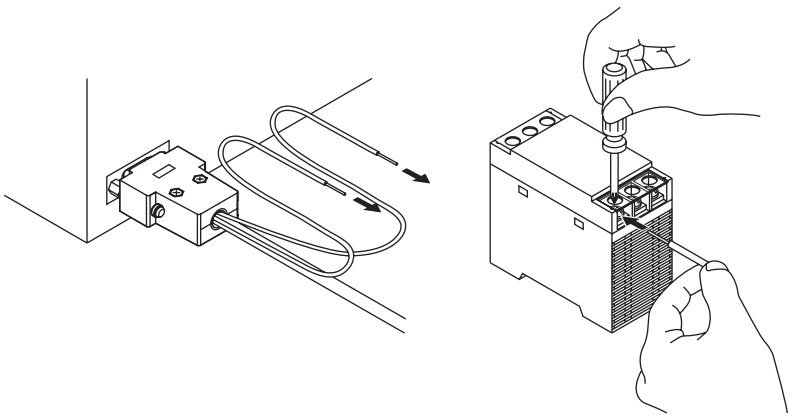
Output current	Power supply voltage
1 A min.	5 VDC ± 10 %

Recommended Power Supply

Model
S8VS-01505

■ Connection Method

Wire the power supply cables as shown in the following diagram.



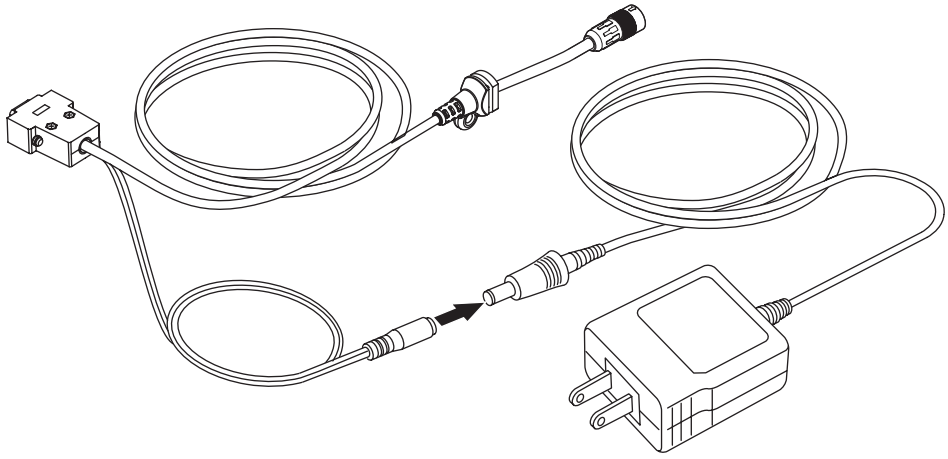
CHECK!

Connect the brown wire to the positive (+) side of the power supply and connect the blue wire to the negative (-) side of the power supply.

Connecting the AC Adaptor (V400-W22-2M/5M)

■ Connection Method

Connect the cable and AC adaptor as shown below.

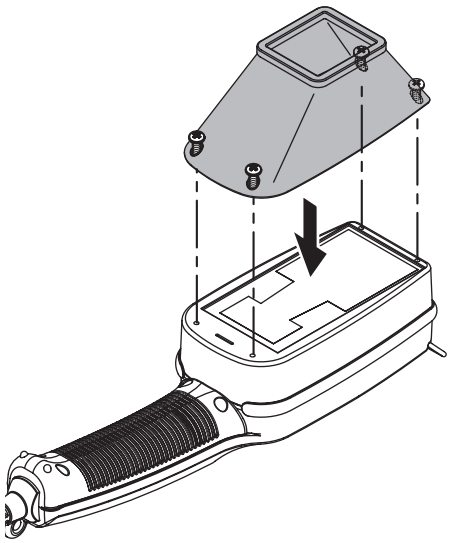


Contactor (Optional)

The Contactor functions as a guide for the distance from the image plane to the code to be read.
By making contact with the read code, the read distance can be easily aligned.

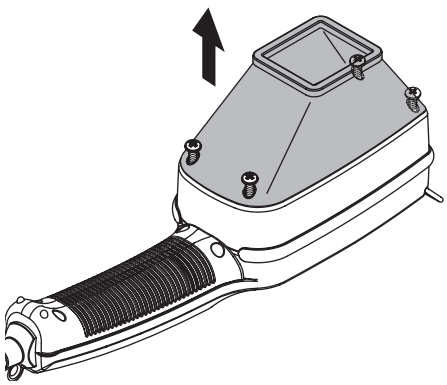
Mounting Procedure

1. Align the screw holes on the connector with those on the main body, and then secure them with the four screws.



Removal Procedure

1. Loosen the four screws to detach the contactor.



Memory Cards

The Handheld 2D Code Reader uses a Memory Card to change communication conditions and function settings in the Setup window and to upload/backup the setting data and the data that has been read. SD Memory Cards are supported.

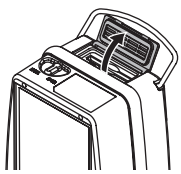
- Conforms to SD Memory Card “Physical Layer Specification 1.01”
- File format: FAT16

Save the data to the Memory Card, insert the Memory Card in the personal computer, and upload the data to easily backup the data to the personal computer. SD Memory Cards are provided with a write prohibit switch to prohibit writing to or formatting of the Memory Card. When the switch is set to LOCK, data cannot be written to or deleted from the Memory Card, and the Memory Card cannot be formatted. These functions are possible by setting the switch to the unlocked state.

Inserting the Memory Card

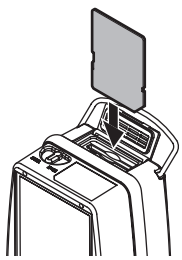
1. Open the Memory Card slot cover.

CHECK! Lift the cover gently, without using excessive force.

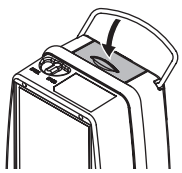


2. Position the Memory Card in the correct direction and insert in the slot until a click is heard.

CHECK! Insert the Memory Card in the direction with the label side facing the same direction as the monitor of the Handheld 2D Code Reader.



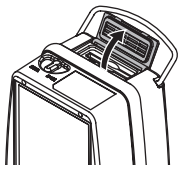
3. Close the Memory Card slot cover.



Removing Memory Cards

1. Open the Memory Card slot cover.

CHECK! Lift the cover gently, without using excessive force.

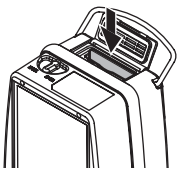


2. Make sure that the indicator on the Memory Card slot is not lit.

CHECK! Do not remove the Memory Card while the indicator is lit. Doing so may damage the Memory Card and the Handheld 2D Code Reader.

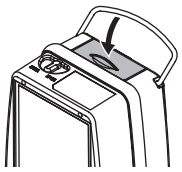
3. Push the Memory Card in gently until a click is heard.

The Memory Card will eject slightly.



4. Pull out the Memory Card straight.

5. Close the Memory Card slot cover.



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Section 3
Reading 2D Code

This section provides information required for reading 2D code.

Basic Operation	36
Startup	37
Reading 2D Code	38
Outputting Results	39
Functions	42

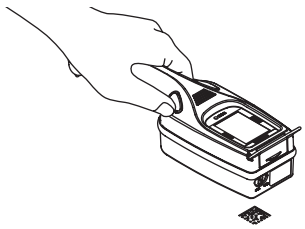
Basic Operation

Startup p.37

Turn ON the power and start the Handheld 2D Code Reader.

Reading 2D Code p.38

Press the trigger buttons and keep pressed while moving the Handheld 2D Code Reader close to the 2D code.



Outputting Results p.39

The read data is output to the monitor and RS-232C communications.

CHECK!

If no operation is performed during a fixed interval, the Handheld 2D Code Reader will enter a sleep state. Pressing the trigger buttons will release the sleep state.

Functions p.42

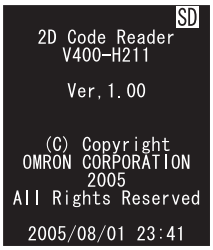
The following functions are provided with the Handheld 2D Code Reader.

- Sleep
- Data Conversion on Display
- Data Accumulation

Startup

When using a cable type, V400-W21-2M/5M, V400-W20-2M/5M, turn ON the switch located on the power supply. When using a cable type, V400-W22-2M/5M, the AC adaptor must be plugged into an AC outlet.

When the power is turned ON, the window on the right will be displayed, the power indicator will light up, and the buzzer will sound.



■ Buzzer

The buzzer will sound under the following conditions.

- When starting the V400
- When reading is successful
- When operating in setting mode

CHECK! When the buzzer is set to OFF, the buzzer will not sound for any operation.

Reading 2D Code

■ Trigger Buttons

The trigger buttons located on the left and right sides of the Handheld 2D Code Reader perform the same operations.

When a trigger button is pressed, the 2D Code Reader will start reading code.

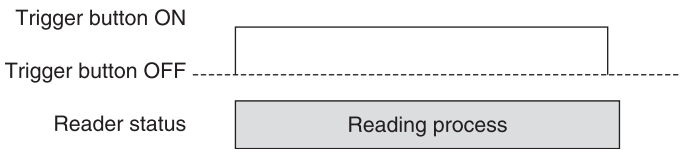
■ Trigger Mode

Triggers can be input two different ways. Select the input method to suit the required application.

◆ Level Trigger (Factory setting)

The 2D Code Reader repeats reading while a trigger button is held down.

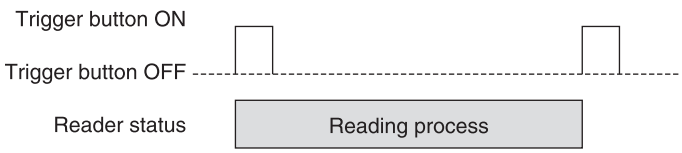
Reading will be stopped when the code has been read successfully or when the trigger button is released.



◆ Alternate Trigger

Once a trigger button is pressed, reading will be repeated even after the trigger button is released.

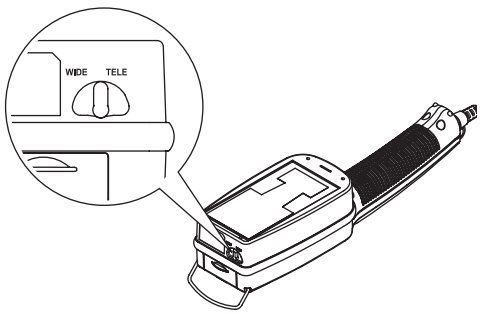
Reading will be stopped when the trigger button is pressed again or when the code has been read successfully.



■ Zoom Lever

The zoom lever is used to change the field of vision to suit the size of the code to be read.

Model	Setting range
V400-H111	5 mm (TELE) to 10 mm (WIDE)
V400-H211	15 mm (TELE) to 30 mm (WIDE)



Outputting Results

■ Monitor Description

The reading results are displayed in the LCD monitor of the main body. They can be displayed in four display modes: Normal, Mode A, Mode B and Mode C.

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◆ Normal

This mode is selected as the default mode (factory setting).

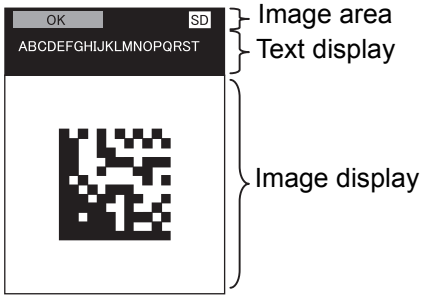


Image area

This area displays the reading status and memory card status.

Item	Details
Reading status	[OK] (green) will appear in the left upper corner of the monitor when the code has been read successfully. If the NG output is set to ON, [NG] (red) will appear in the left upper corner of the monitor when reading of the code has failed.
Memory Card	A SD mark (blue) appears when a Memory Card is present. Displays the SD mark in red when the Memory Card is active to indicate that the Memory Card is being accessed.

Text display area

This area displays the read data and conversion data (by the data conversion display function).

In the case of Normal and Mode A, up to 38 characters can be displayed.

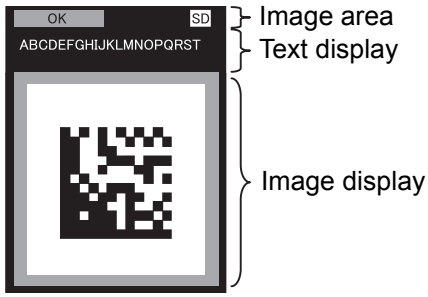
In the case of Mode B, up to 228 characters can be displayed.

Image display area

This area displays images taken by the Camera.

◆ Mode A

This mode is designed to facilitate understanding of the reading status. When the code has been read successfully, the image display area is enclosed in a green frame.When the NG output is set to ON, the image display area will be enclosed in a red frame if reading of the code has failed.

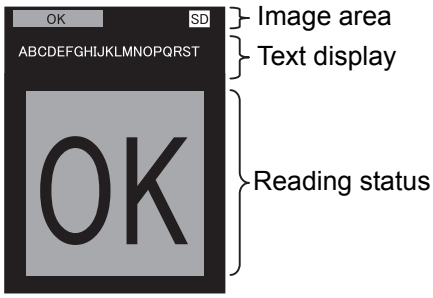


◆ Mode B

Priority is given to the characters of read data. When the data consists of two or more lines, the image display area is hidden and the data is displayed by characters. Characters can be displayed up to the bottom of the screen.

◆ Mode C

Only the reading status is displayed in large size. The reading status blinks a few times and then remains lit until the trigger button is pressed. No images are displayed.



■ LED Indicators

Indicator	Location	Details
Power	On the bottom of the monitor	Lit when power is turned ON, and remains lit during operation
Memory Card	Beside the Memory Card slot	Lit while the Memory Card is being accessed. Do not remove the Memory Card while this indicator is lit.

■ RS-232C Communications Output

◆ Output for Successful Readings

Read data is output in the following format.

Header	Read data	Footer

◆ Output for Unsuccessful Readings

Nothing is output with the factory setting.

An error code output, however, can be set for unsuccessful readings.

* NG output setting

When the NG output is set to ON, the output contents can be changed.

Output contents when NG output is ON:

- The NG mark is displayed on the monitor in red.
- The data “?E000” is sent via RS-232C communications.

Header	?E000	Footer

Functions

■ Sleep

The Handheld 2D Code Reader is equipped with a sleep function for reducing power consumption.

The Code Reader is automatically set to sleep when operation is not performed for a specified period of time.

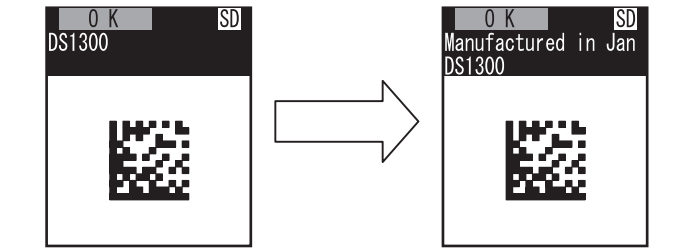
• 30 Seconds Lapsed (Default Setting)

To cancel sleep and put the Code Reader in normal state, press one of the trigger buttons. The Code Reader will be put ready for operation.

■ Data Conversion on Display

Normally, 2D code data that is read is displayed as is on the monitor. This function compares the read data, converts into separate text strings and displays the converted data.

p.67



Display example when the function is OFF

Display example when function is ON

■ Data Accumulation

The read data is not only output via RS-232C communications, but is created as a file in the Memory Card and saved in CSV format.

p.65

Section 4
System Settings

This section explains how to set measurement conditions and functions. There are two methods: one is to use the LCD monitor of the Coder Reader, and the other is to use “2DCR Configear” on a personal computer.

Overview	44
Making Settings on the Main Body	46
Uploading from the Memory Card	53
Restoring the Factory Setting Data	57
Installing the 2DCR Configear	58
Communicating Using 2DCR Configear	60
Creating Setting Files Using the 2DCR Configear	63

Overview

Measurement conditions and functions can be changed using the LCD monitor of the Coder Reader or using “2DCR Configear” on a personal computer.

■ Using the LCD monitor

Creating the Setting Files p.46

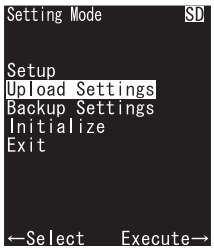
Set necessary functions in the Setup screen and save them.
The following items can be set.
Communications settings
Function settings

Backing Up Data p.56

To reflect the data you have set to two or more Code Readers, the data must be backed up to a Memory Card.

Uploading Data p.54

To reflect the data you have set to two or more Code Readers, the data must be uploaded.



■ Using “2DCR Configear” on a personal computer

Installing the Software p.58

Download the application software from home page, and install it.

Contact the OMRON representative nearest you regarding the website address.

Creating Setting Files p.63

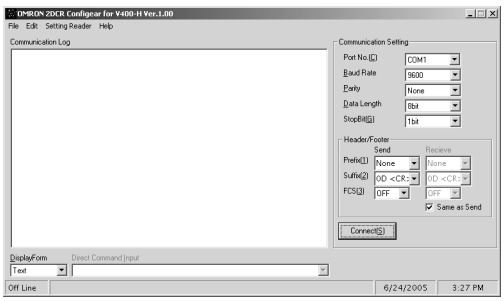
Create the setting file using the 2DCR Configear.

Specify the required settings using the 2DCR Configear, and create as a file.

The following items can be set.

Communications settings

Function settings



Uploading Data p.72

Upload the created setting data to the Handheld 2D Code Reader.

The following two loading methods are available.

- Using the 2DCR Configear
- Using the Memory Card

Making Settings on the Main Body

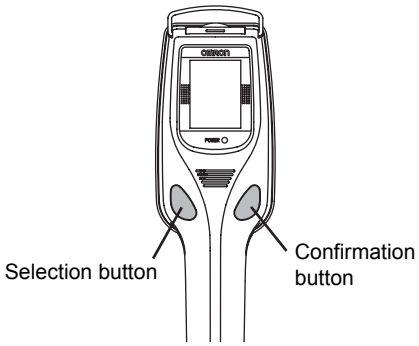
The LCD monitor of the Code Reader can be used to set communication conditions and functions.
For this, a Memory Card is required.

Basic Operation for Setting Mode

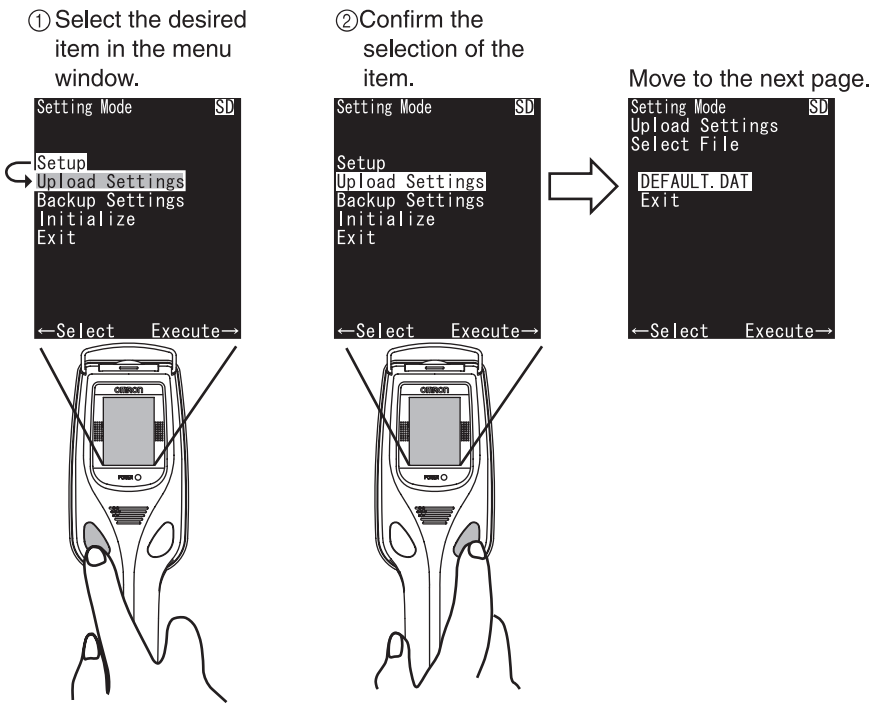
In the setting mode, the trigger buttons have different functions.

Left: Selection button (to select items, to change settings)

Right: Confirmation button (to display the next page, to switch between the item and setting fields)



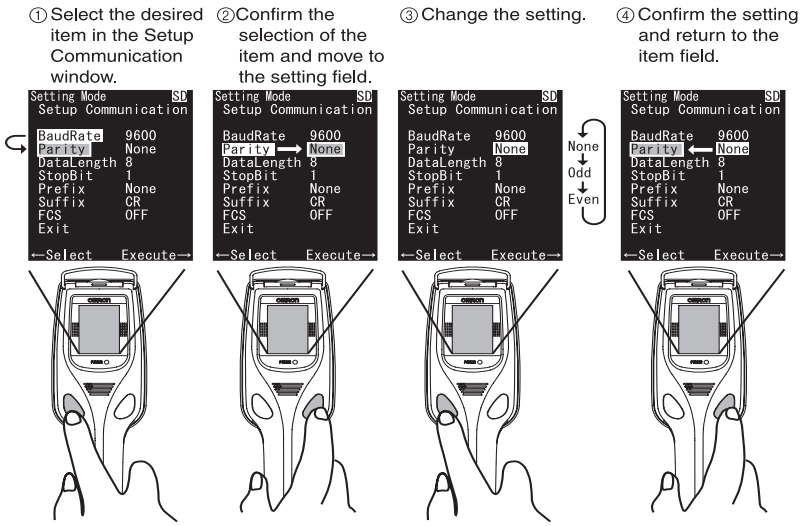
To select [Upload Settings] in the menu screen, carry out the following steps.



This series of operations whereby pressing the left trigger button to select [Upload Settings] and then pressing the right trigger button to confirm the selection is expressed as “selecting [Upload Settings]”.

To set communication conditions or functions, select the desired setting.

To change Parity (communication condition), carry out the following steps.



Starting Setting Mode (Setup Screen)

1. Start setting mode.

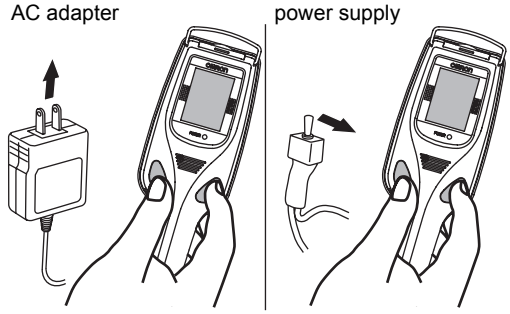
Setting mode can be started by the following two methods.

1 Turn ON the power to the Code Reader while holding both right and left trigger buttons.

2 Insert the Memory Card into the slot while holding both right and left trigger buttons.

When using the AC adapter

When using the power supply



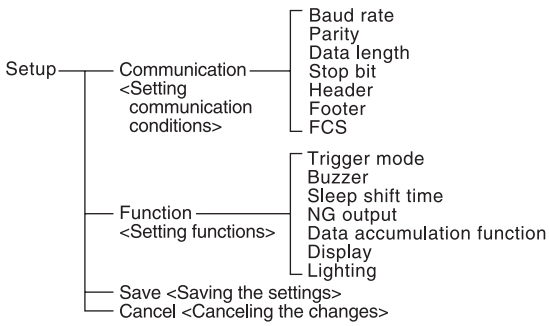
The setting mode menu window will be displayed.

CHECK! If the Memory Card does not have a folder called “SETTINGS”, “Upload Settings” will not be displayed in the menu window. However, it is still possible to set measurement conditions and functions even if “Upload Settings” is not displayed, but the set data cannot be uploaded.

2. Select [Setup].

The Setup window appears.

- Setup window structure



Changing Communication Conditions

1. Select [Communication] in the Setup window.

The Setup Communication window appears.

2. Select the item to be changed.

The cursor moves to the right of the selected item.

3. Change the setting.

Available settings are shown in the table below. After a new setting is selected, the cursor moves to the item field.

Setting item	Settings
Baud rate (BaudRate)	**9,600***, 19,200, or 38,400
Parity	**None***/Odd/Even
Data length (DataLength)	7bits or **8 bits***
Stop Bit (StopBit)	**1 bit*** or 2 bits
Header (Prefix)	**None***/STX/ESC
Footer (Suffix)	ETX/LF/**CR***/CR+LF
FCS	ON or **OFF***

The default settings are indicated with an asterisk.

4. Exit communication setting.

When all the desired changes are made, select [Exit]. The Setup window will reappear.

CHECK!

If [Cancel] is selected in the Setup window after changes are made in the Setup Communication window, the previous settings (before changes are made) can be restored.

5. Save the setting data.

Select [Save] in the Setup window.

After the save window is displayed, the menu window will be displayed.

CHECK!

To reflect the changes made on a Code Reader to two or more Code Readers, the data must backed up to the Memory Card and then uploaded to those Code Readers.

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6. Exit setting mode.

Select [Exit] in the menu window. The setting mode will be exited.

Setting Functions

1. Select [Function] in the Setup window.

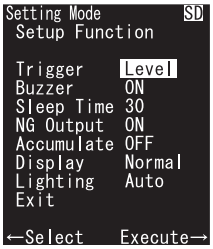
The Setup Function window appears.

2. Select the item to be changed.

The cursor moves to the right of the selected item.

3. Change the setting.

Available settings are shown in the table below. After a new setting is selected, the cursor moves to the item field.



Setting item	Settings	
Trigger mode (Trigger)	**Level*** /Alternate	
Buzzer	**ON*** /OFF	
Sleep shift time (Sleep Time)	**30***/60/90/120	
NG Output	**OFF***/ON	
Data accumulation function (Accumulate)	**OFF***/ON/ON + Time	
Display	**Normal***/(Mode A)/ Mode B/ Mode C	
Lighting	V400-H111	**Auto***/Oblique/R-coax/G-coax/B-coax
	V400-H211	**Auto***/Oblique/Coaxial

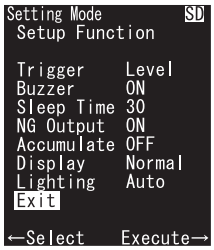
The default settings are indicated with an asterisk.

4. Exit function setting.

When all the desired changes are made, select [Exit]. The Setup window will reappear.

CHECK!

If [Cancel] is selected in the Setup window after changes are made in the Setup Function window, the previous settings (before changes are made) can be restored.



5. Save the setting data.

Select [Save] in the Setup window.

After the save window is displayed, the menu window will be displayed.

CHECK!

To reflect the changes made on a Code Reader to two or more Code Readers, the data must backed up to the Memory Card and then uploaded to those Code Readers.

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6. Exit setting mode.

Select [Exit] in the menu window. The setting mode will be exited.

Uploading from the Memory Card

The Memory Card can be used to upload the setting data to the Handheld 2D Code Reader. The following procedure needs to be performed to reflect the changes made on a Code Reader to two or more Code Readers or to reflect the data set using “2DCR Configear” to a Code Reader.

Starting Setting Mode

1. If the data is created using “2DCR Configear”, the data must be saved to the Memory Card.

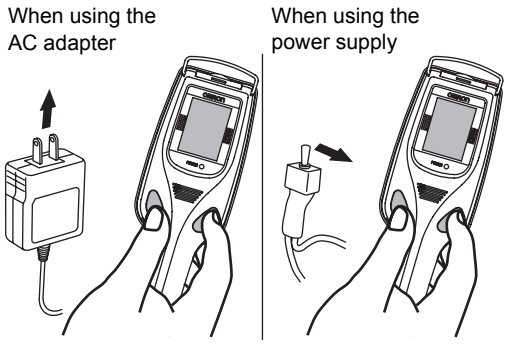
CHECK!

To save data to the Memory Card, create a folder with the name SETTINGS, and save. If the data is saved to a folder other than “SETTINGS”, it cannot be uploaded.

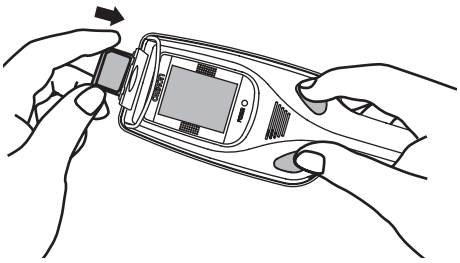
2. Start setting mode.

Setting mode can be started by the following two methods.

1 Turn ON the power to the Code Reader while holding both right and left trigger buttons.



2 Insert the Memory Card into the slot while holding both right and left trigger buttons.



The setting mode menu window will be displayed.

Uploading Setting Data to the 2D Code Reader

CHECK!

To reflect the changes made on a Code Reader to two or more Code Readers, the data must backed up to the Memory Card first.

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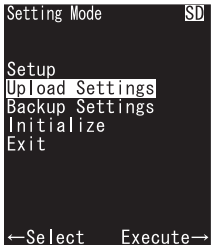
1. Select [Upload Settings] in the menu window.



The Select File window will be displayed.

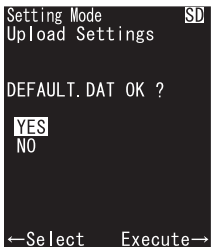
2. Select the data setting file.

In the Select File window, select the data setting file to be used.
The contents of the SETTINGS folder in the Memory Card will be displayed.

After the Upload Settings window is displayed, the following save selection window will be displayed.

3. Save the setting data.

Select [YES] in the save selection window.



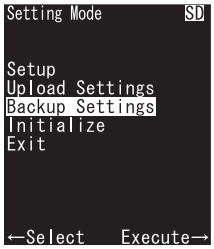
After the save window is displayed, the menu window will be displayed.

4. Exit setting mode.

Select [Exit] in the menu window. The setting mode will be exited.

Backing Up 2D Code Reader Data

1. Select [Backup Settings] in the menu window.



▼

The Backup Settings window will be displayed.

2. Save the setting data.

Select [YES] in the Backup Settings window.

CHECK! The setting data file will be backed up in the SETTINGS folder in the Memory Card.
The SETTINGS folder will be automatically created if it does not already exist. The file name will be SETTINGS.DAT.

▼

After the save window is displayed, the menu window will be displayed.

3. Exit setting mode.

Select [Exit] in the menu window. The setting mode will be exited.

Restoring the Factory Setting Data

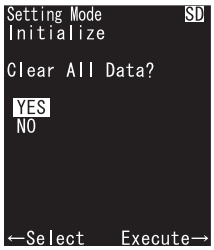
The communication and function settings can be returned to the factory settings.

1. Select [Initialize] in the menu window.

A confirmation window will be displayed.

2. Return the settings to the factory settings.

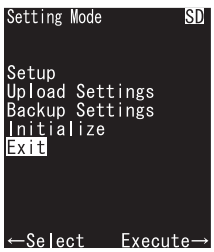
Select [YES] in the confirmation window.



The menu window will appear after the communication and function settings have been returned to the factory settings.

3. Exit setting mode.

Select [Exit] in the menu window. The setting mode will be exited.



Installing the 2DCR Configear

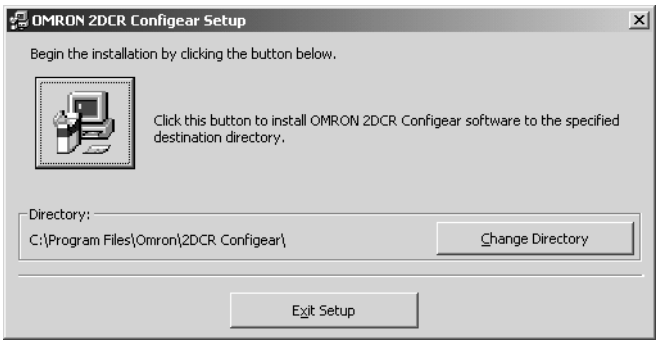
Download the application software from home page, and install it.
Contact the OMRON representative nearest you regarding the website address.

1. Open the setup.exe file downloaded from the home page.
The following window will be displayed.

2. Click the [OK] button.

OMRON 2DCR Configear Setup
Welcome to the OMRON 2DCR Configear installation program.
Setup cannot install system files or update shared files if they are in use. Before proceeding, we recommend that you close any applications you may be running.
OK
Exit Setup

3. Click the button.


OMRON 2DCR Configear Setup
Begin the installation by clicking the button below.
Click this button to install OMRON 2DCR Configear software to the specified destination directory.
Directory:
C:\Program Files\Omron\2DCR Configear\
Change Directory
Exit Setup

4. Click the [Continue] button.

Setup will start when the [Continue] button is clicked.

OMRON 2DCR Configear - Choose Program Group
Setup will add items to the group shown in the Program Group box. You can enter a new group name or select one from the Existing Groups list.
Program Group:
Omron
Existing Groups:
Accessories
Omron
Startup
Continue
Cancel

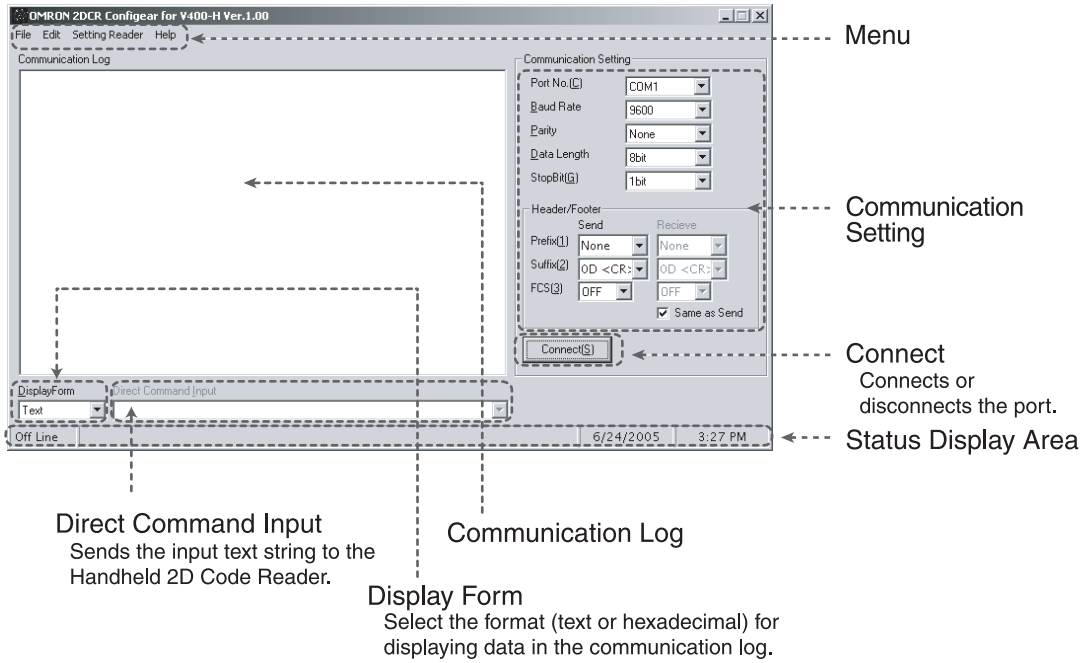
5. Click the [OK] button.

CHECK!

When “2DCR Configear” is no longer required, uninstall it by selecting [Control Panel] - [Add/Remove Hardware] on your computer.

Communicating Using 2DCR Configear

The 2DCR Configear can be used to communicate with the Handheld 2D Code Reader.



■ Communication Setting

The following items can be set. However, the settings cannot be changed while the port is being connected.

Setting item		Settings	
Port No.		**COM1*** to COM 9	
Baud Rate		**9,600***, 19,200, or 38,400	
Parity		**None***, odd, or even	
Data Length		77 bits or **8 bits***	
Stop Bit		**1 bit*** or 2 bits	
Header/Footer	Prefix	Send	**None***, 02 <STX>, or 1B <ESC>
		Receive	**None***, 02 <STX>, or 1B <ESC>
	Suffix	Send	ETX, 0A LF, **0D CR***, or 0D0A CR+LF
		Receive	ETX, 0A LF, **0D CR***, or 0D0A CR+LF
	FCS	Send	ON or **OFF***
		Receive	ON or **OFF***
Same as Send		Sets the header, footer, and FCS for receiving to the same settings as for sending.	

The default settings are indicated with an asterisk.

■ Menu

◆ File

Save Log...
Saves the data displayed in the communication log as a text file.

Save Environment
Saves the settings made in the communications settings.

End
Ends the 2DCR Configear.

◆ Edit

Copy Log
Copies the log displayed in the communication log to the clipboard.

Erase Log
Deletes the log displayed in the communication log.

◆ Setting Reader

Create Data...
Creates the data setting file for loading set data to the Handheld 2D Code Reader.
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Auto Scan
Automatically obtains the conditions required for communicating with the Handheld 2D Code Reader.
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Send Setting
Sends the data setting file from the host to the Handheld 2D Code Reader.
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Receive Setting
Sends the data set on the Handheld 2D Code Reader to the host and saves it with a new file name.

Set Date, Time
Sends the clock time of the personal computer in which 2DCR Configear is installed to the Handheld 2D Code Reader.

CHECK! The clock is factory set to Japanese Standard Time.

◆ Help

Version
Displays the software version of the 2DCR Configear installed.

■ Buttons

◆ Connect

Connects or disconnects the port.

■ Display Form

Selects the format for displaying data in the communication log.
Either text display or hexadecimal display can be selected. (Default setting: Text display)

■ Direct Command Input

Sends the input text string to the Handheld 2D Code Reader.

■ Status Display

◆ Port status

Indicates the port status. (On Line: Connected; Off Line: Disconnected)

◆ Communication conditions

Displays the current communications conditions. (Example: COM1 9600,n,8,1)
This is not displayed when the port is disconnected.

◆ Date

Displays the current date. (Example: 2005/01/26)

◆ Time

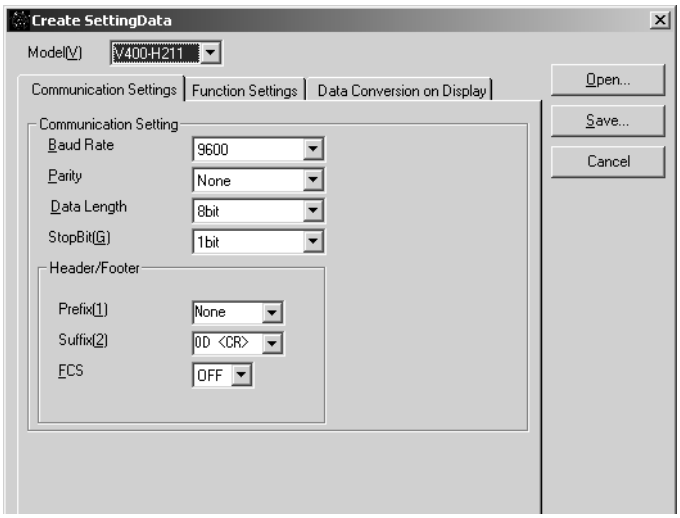
Displays the current time. (Example: 9:27)

Creating Setting Files Using the 2DCR Configear

Creates the data setting file for loading set data to the Handheld 2D Code Reader.
Make the settings for the communications conditions, functions, and display conversion.

▶Select **Setting Reader - Create Data...** from the menu.

The following window for creating the setting data file will be displayed.



■ Model(V)

Selects the code reader model. Before setting other items, select the model of the code reader you are using.

■ Open

Opens the previously created data setting file for editing.
The [Receive (R)] function can be used to open the data file downloaded from the Code Reader and edit it.

■ Save

Saves the created data setting file.

CHECK! To save data to the Memory Card, create a folder with the name SETTINGS, and save. If the data is saved to a folder other than “SETTINGS”, it cannot be uploaded.

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Communication Settings

The settings shown in the following table are set in the [Communication Settings] tab Page in the Create Setting Data Window.

Setting item		Settings
Baud Rate		**9,600***, 19,200, or 38,400
Parity		**None***, odd, or even
Data Length		77 bits or **8 bits***
Stop Bit		**1 bit*** or 2 bits
Header/Footer	Prefix	**None***, 02 <STX>, or 1B <ESC>
	Suffix	ETX, 0A LF, **0D CR***, or 0D0A CR+LF
	FCS	ON or **OFF***

The default settings are indicated with an asterisk.

The format when FCS is ON is as follows:

Header	Read data	FCS (2 bytes)	Footer

CHECK! For details on FCS calculation methods, refer to FCS Calculation Method.

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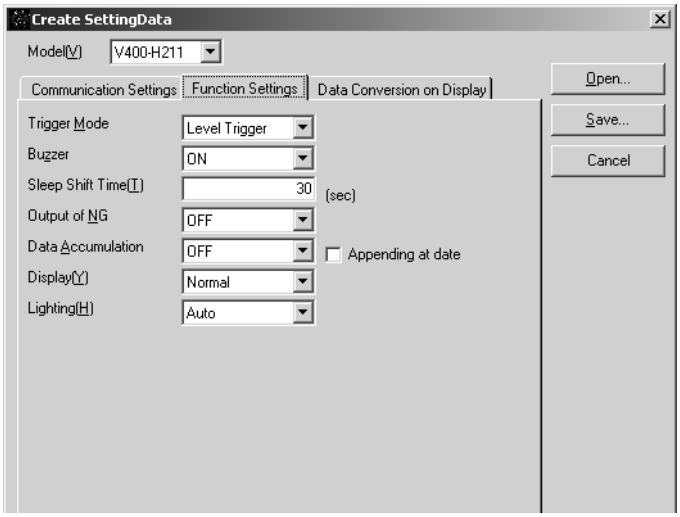
Function Settings

Make the following settings in the [Function Settings] tab of the Create Setting Data Window.



Setting item	Settings	
Trigger Mode	**Level Trigger*** or Alternate	
Buzzer	**ON*** or OFF	
Sleep Shift Time	Between **30 sec*** and 120 sec	
NG output (N)	ON or **OFF***	
Data Accumulation	**OFF*** or ON	
Display(Y)	**Normal***/Mode A/Mode B/Mode C	
Lighting (H)	V400-H111	**Auto***/Oblique/R-coax/G-coax/B-coax
	V400-H211	**Auto***/Oblique/Coaxial

The default settings are indicated with an asterisk.

■ Data Accumulation

Set whether to collect data.

The Memory Card must be inserted in the Handheld 2D Code Reader to use this function.

When this function is ON, read data will be saved in a file with the following name in the Memory Card's READDATA folder. The READDATA folder will be automatically generated if it does not already exist.

READ****.csv

Note: The digits indicated by **** start at 0000 and increment by 1 for approximately each 40 kilobytes.

After reading is completed, the data is written to the Memory Card, which will take several seconds.

When Appending at date is selected, the date and time will be added to the read data.

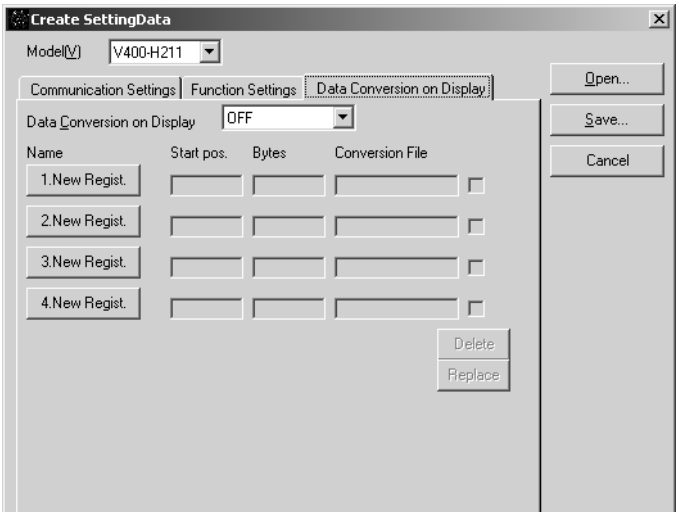
Example of Saved File

ABC0001, 2005/01/27, 12:48:30
ABC0003, 2005/01/27, 12:51:02
ABC0109, 2005/01/27, 12:59:41
ABC0075, 2005/01/27, 12:59:47

Data Date Time

Data Conversion on Display

Click the [Data Conversion on Display] tab in the Create Setting Data Window to convert a CSV file for display.



■ Setting Method

1. Create the CSV file for the display conversion function.

To use this function, CSV files for display conversion must be created using separate spreadsheet software or a text editor for the personal computer.

The following formatting restrictions apply.

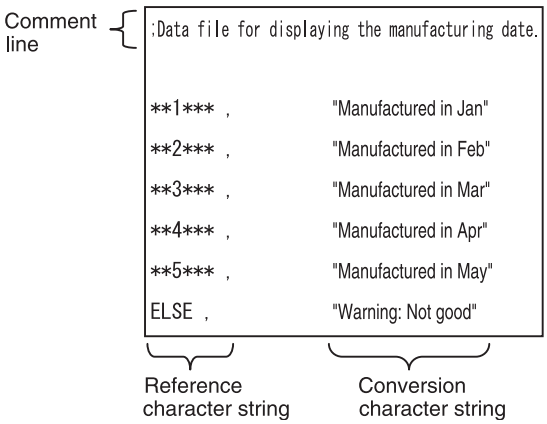
File: CSV format (comma delimited)

Maximum No. of records: 1000

Maximum No. of comparison characters: 20

Maximum No. of conversion characters: 19

Comment row: Add a semicolon (;) to the beginning of the row.


Comment line
;Data file for displaying the manufacturing date.
1* , "Manufactured in Jan"
2* , "Manufactured in Feb"
3* , "Manufactured in Mar"
4* , "Manufactured in Apr"
5* , "Manufactured in May"
ELSE , "Warning: Not good"
Reference character string
Conversion character string

Enter comparison text and conversion text in each row.

The symbols and text in the following table function as special characters with specific meanings.

Symbol	Name	Details
*	Wild card	Any data OK
!a	Alphabet	Any lower-case character OK
!A	Alphabet	Any upper-case character OK
!n	Numeric value	Any numeral OK
ELSE	Condition for no match	Enter at end.

CHECK!

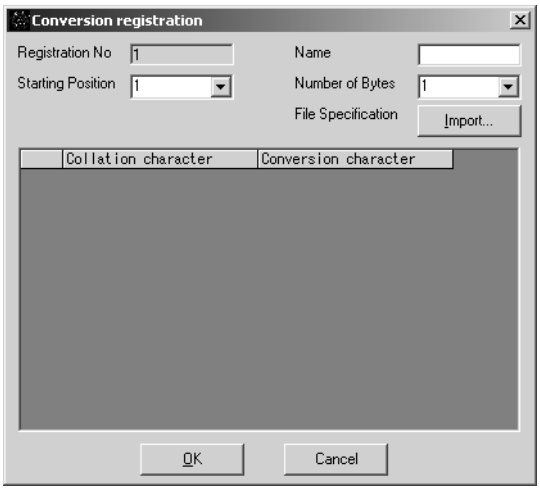
Comparison Principle

With display conversion, comparison is performed with the data contained in the file, and the display contents is changed to the registered text strings for characters that match.

Matching processing is performed in order starting from the beginning of the file. Once a match is found, no further comparisons are made, i.e., matching processing is affected by the entry order. Therefore, when comparing complicated patterns, make sure that the optimum order is used.

2. Click [1. New Regist.].

The Conversion Registration window appears.



3. Select the desired start position and number of bytes.

Specify the part of the read data to be compared.

Specify the data position from which comparison is to be started and the number of data bytes to be compared.

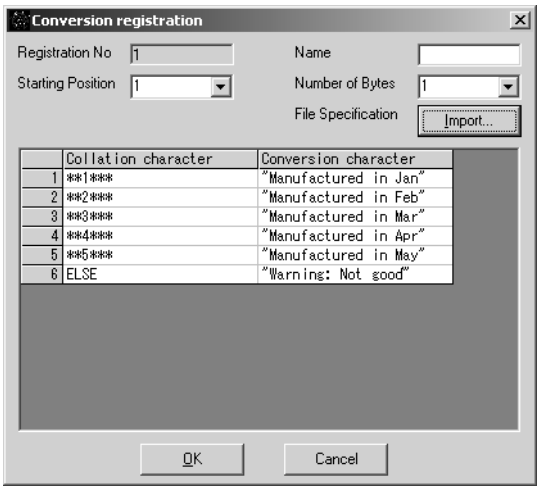
If you want to compare all the read data, specify "1" in [Starting Position] and "All" in [Number of Bytes].

4. Click the [Import] button.

Import the created file to the 2DCR Configear to convert the created file to a format that can be uploaded to the Handheld 2D Code Reader

5. Select the CSV file to be uploaded and click the [Open] button.

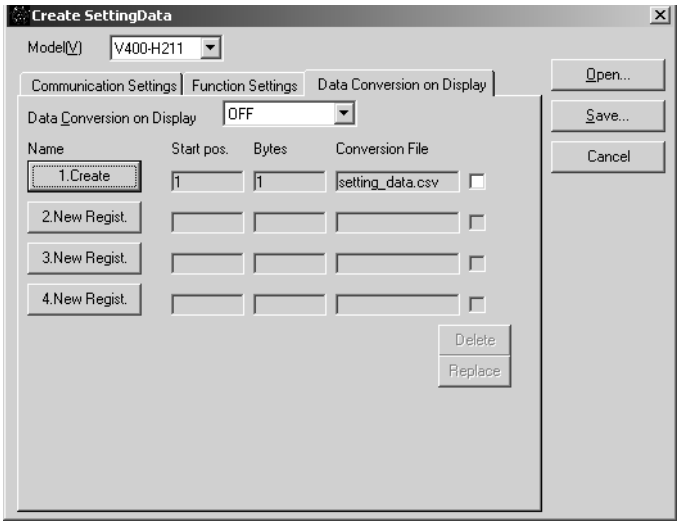
The CSV file will be read and displayed as shown in the following diagram.



6. Enter the desired name.

7. Click the [OK] button.

The [Data Conversion on Display] tab will reappear.



8. Select ON in [Data Conversion on Display] field.

■ Deleting Items and Changing Item Order

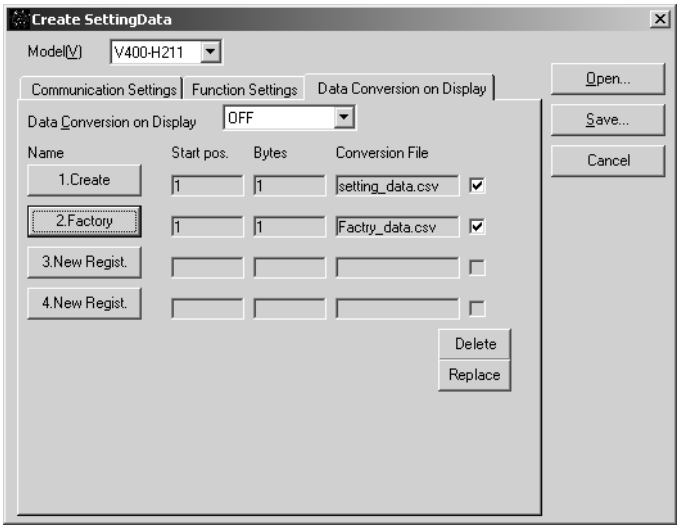
The [Data Conversion on Display] tab allows you to set up to four conversion file items.

◆ Deleting the selected items

Check the checkboxes for the items to be deleted, and then click the [Delete] button.
After a confirmation message is displayed, the selected items will be deleted.

◆ Swapping the order of the selected items

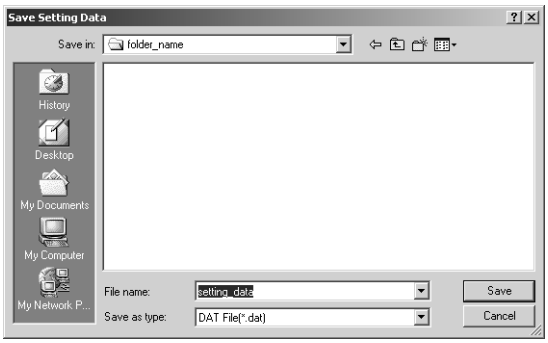
Check the checkboxes for the items to be deleted, and then click the [Replace] button.
After a confirmation message is displayed, the order of the selected items will be swapped.



Saving

1. Save the settings.

Click the [Save] button, specify the save destination for the data settings in the Save Setting Data Window, and then click the [Save] button.



CHECK!

To save data to the Memory Card, create a folder with the name SETTINGS, and save. If the data is saved to a folder other than “SETTINGS”, it cannot be uploaded.

p.53

2. Exit creation of setting data file.

Click the [Cancel] button in the Create Setting Data window.

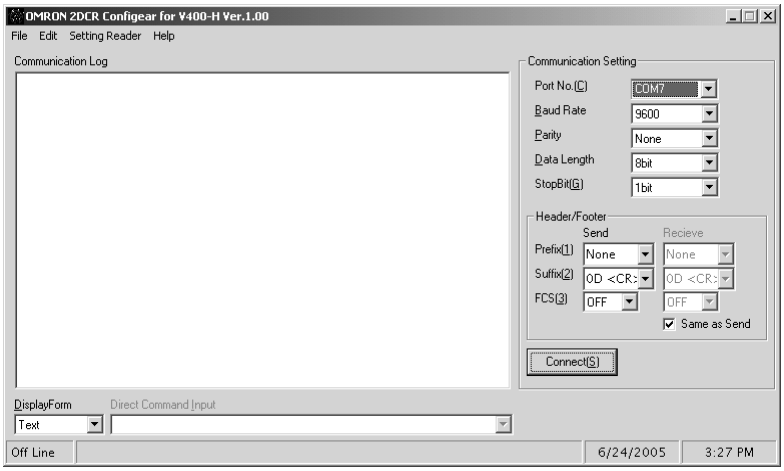
Sending the Setting File to the 2D Code Reader

The setting data created using “2DCR Configear” can be sent to the 2D Code Reader as follows.

1. Connect the cable to the RS-232C interface.

p.28

2. Check the port number.



3. Select [Setting Reader] - [Auto Scan] from the menu.

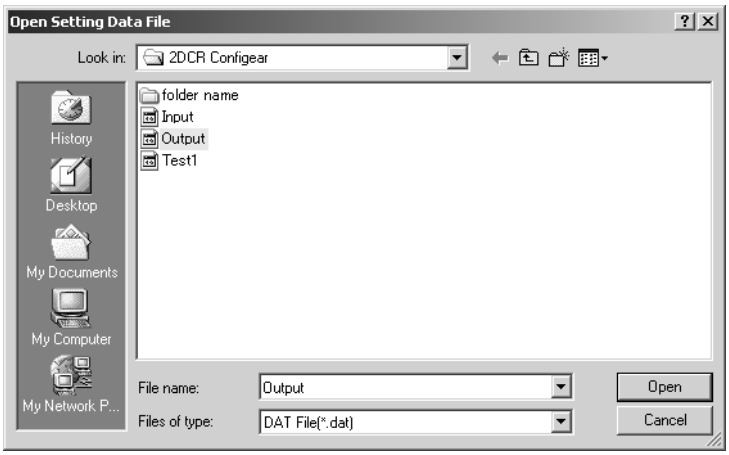
The 2D Code Reader automatically obtains the communication conditions required for communicating with the Code Reader, and a message will be displayed when the conditions are obtained successfully.

4. Click the [Connect(S)] button.

Communication with the 2D Code Reader starts. “On Line” will be displayed in the status display area.

5. Select [Setting Reader] - [Send Setting] from the menu.

The following file selection window will be displayed.

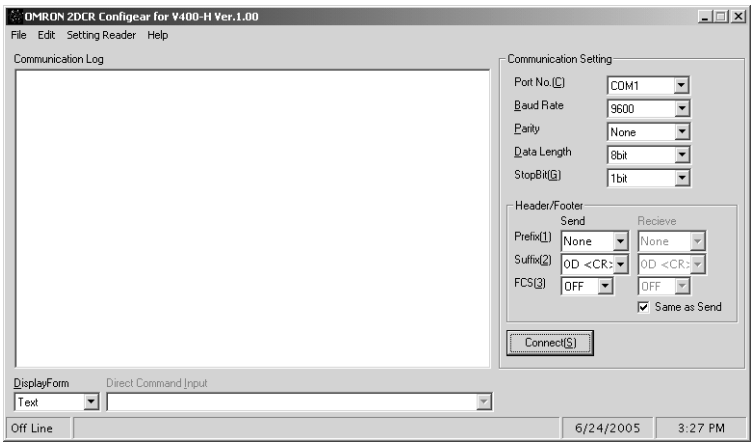


6. Select the desired file and click the [Open] button.

The selected file will be uploaded to the 2D Code Reader. A message indicating that uploading is in progress will be displayed.

7. Exit the 2DCR Configear.

Click [File] - [End] to exit the 2DCR Configear.



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Section 5
Troubleshooting

This section explains the countermeasures to take when reading cannot be executed correctly or when a problem occurs.

Troubleshooting 76

Troubleshooting

Status	Cause and countermeasures	Page
The POWER indicator is not lit.	The power line is not connected properly. Insufficient power	p.29
The video monitor image is not clear.	Some pixels on the monitor may not light and some may always light. This is a result of the monitor's construction and does not indicate a malfunction.	-
Cannot write data to Memory Card	The write-protect switch on the Memory Card is ON. The Memory Card capacity is insufficient. The Memory Card is damaged. The Memory Card has not been formatted. The Memory Card is the wrong type.	-
The saved data is corrupted.	The Memory Card was removed while it was being accessed.	p.41
The time stamp on saved data is not correct.	The clock is not set correctly. The clock is factory set to Japanese Standard Time. Set the clock as required.	p.60
Cannot communicate with the host device.	The cable model is incorrect. The cable connections are loose. The communications settings are not correct.	p.20 p.60

Appendices

Maintenance	78
Specifications and Dimensions	79
ASCII Table	84
FCS Calculation Method	85
Data Capacity Tables	87

Maintenance

Handling the Handheld 2D Code Reader

- Do not touch the lens or monitor with your fingers or any pointed object.
- Do not use the Handheld 2D Code Reader in locations subject to dust or other contaminants.

Inspection

To maintain the Handheld 2D Code Reader in optimum condition, perform the following inspections regularly.

- Use a lens cloth or air brush to clean the lens and monitor.
- Use a soft cloth to clean other parts of the Handheld 2D Code Reader.

Inspection items	Details	Required tools
Power supply	The voltage measured at the power supply terminals on the terminal block must be 5 VDC ± 10%.	Multimeter
Ambient operating temperature	The ambient operating temperature must be between 0 and 40 °C.	Thermometer
Ambient operating humidity	The ambient operating humidity must be between 35% and 85%.	Hygrometer

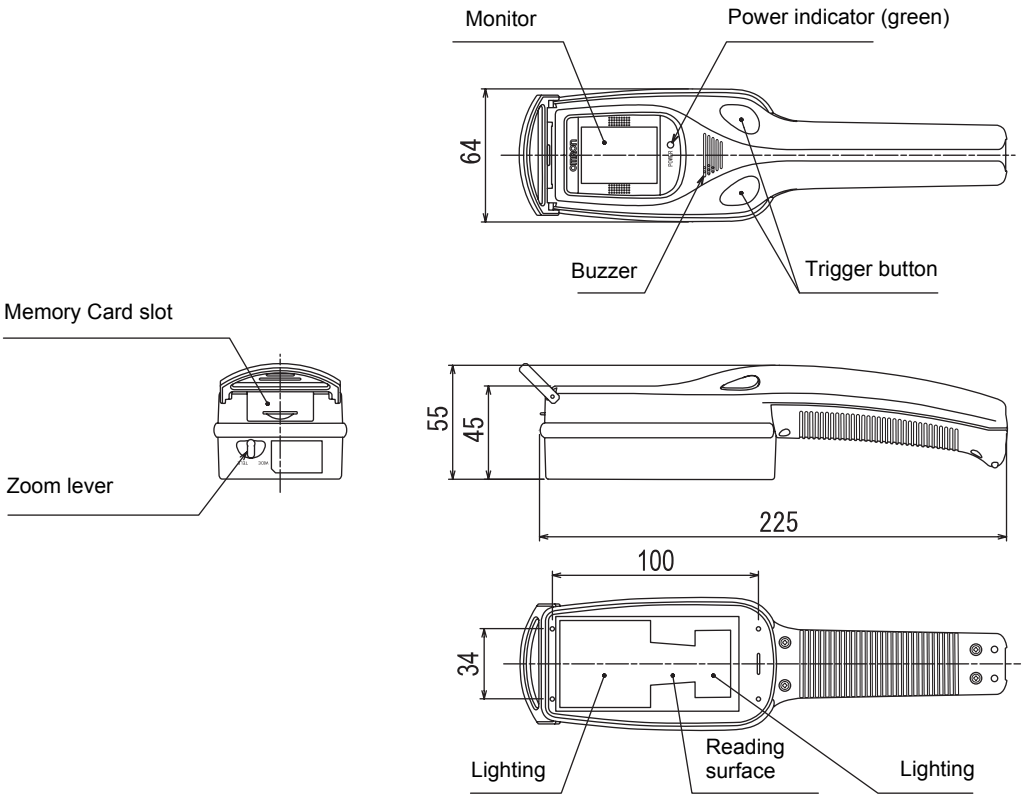
- Turn OFF the power and take safety precautions before conducting maintenance or inspections.
- Do not use thinners or benzene to clean the Controller.

Specifications and Dimensions

Handheld 2D Code Reader

■ V400-H111/211

(Unit: mm)

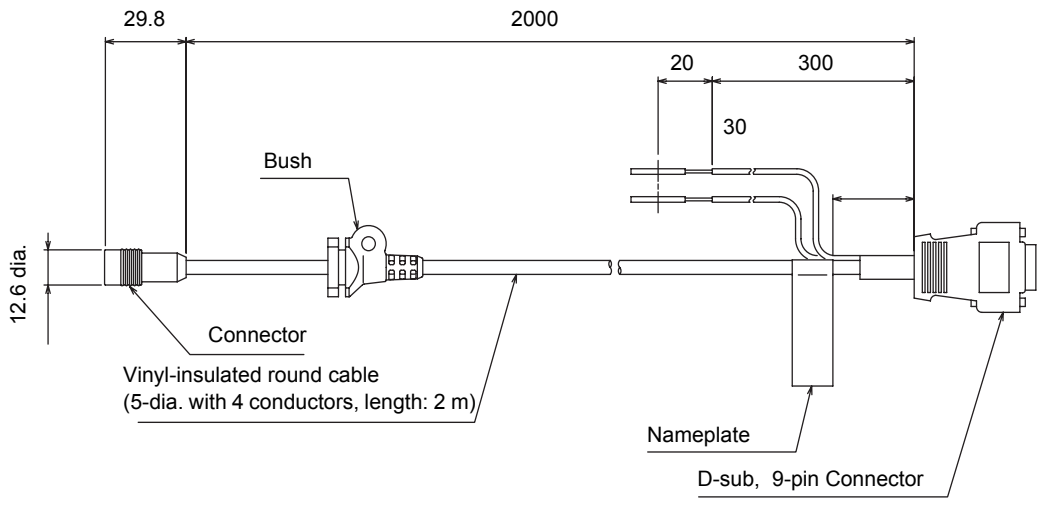


	V400-H111	V400-H211
Field of vision	5 to 10 mm	15 to 30 mm
Working distance	40 mm (contact with the code when the Contactor is mounted)	
Power supply voltage	5 VDC ± 10 %	
Current consumption	1 A max.	
Serial interface	RS-232C	
Applicable code	DataMatrix ECC200 10 × 10 to 64 × 64, 8 × 18 to 16 × 48 QR Code Model 1.2 21 × 21 to 57 × 57 (Ver. 1 to 10)	
Operating method	Pushbutton control using the trigger buttons	
System Settings	Operation in the Setup window (on Code Reader), uploading setting data using a Memory Card, or communication by “2DCR Configear”	
Memory Card	SD card	
Monitor	1.8-inch TFT liquid crystal display for displaying image and read data	
Indicators	Power indicator and Memory Card access indicator	
Ambient temperature	Operating: 0 to 40°C Storage: -25 to 60°C	
Ambient humidity	35% to 85%(with no condensation)	
Ambient environment	No corrosive gases	
Vibration resistance	10 to 150 Hz ; half-amplitude: 0.35 mm (max. acceleration: 50 m^2/s)	
Shock resistance	150m^2/s 3 times in 6 directions	
Weight	Approx. 230 g	
Degree of protection	IEC 60529 (IP64)	
Materials	Case: ABS; Optical surface: PC; Display: PMMA	

Cable

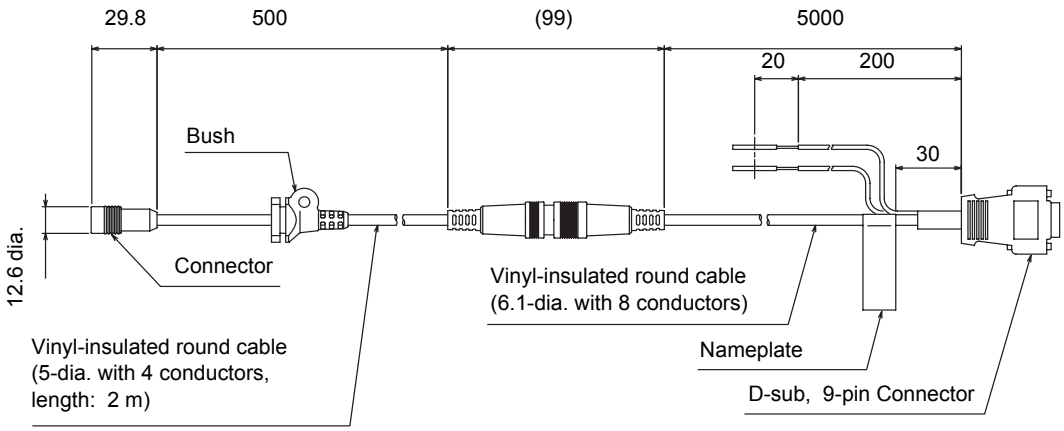
■ V400-W20-2M/V400-W21-2M

(Unit: mm)



■ V400-W20-5M/V400-W21-5M

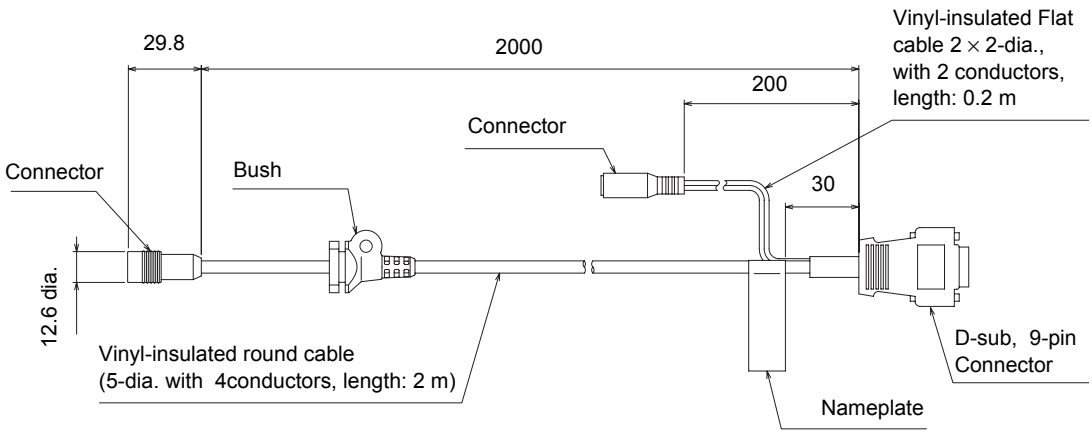
(Unit: mm)



	V400-W20-2M	V400-W20-5M	V400-W21-2M	V400-W21-5M
Interface connector	D-sub, 9-pin, male		D-sub, 9-pin, female	
Ambient temperature	Operating: 0 to 40°C Storage: -25 to 60°C			
Ambient humidity	35 % to 85 % (with no condensation)			
Ambient environment	No corrosive gases			
Materials	Cable sheath: Heat-resistant vinyl chloride Special connector: PPS, PBT, POM D-sub connector: ABS			
Minimum bending radius	30 mm			
Weight	Approx. 100 g	Approx. 340 g	Approx. 100 g	Approx. 340 g

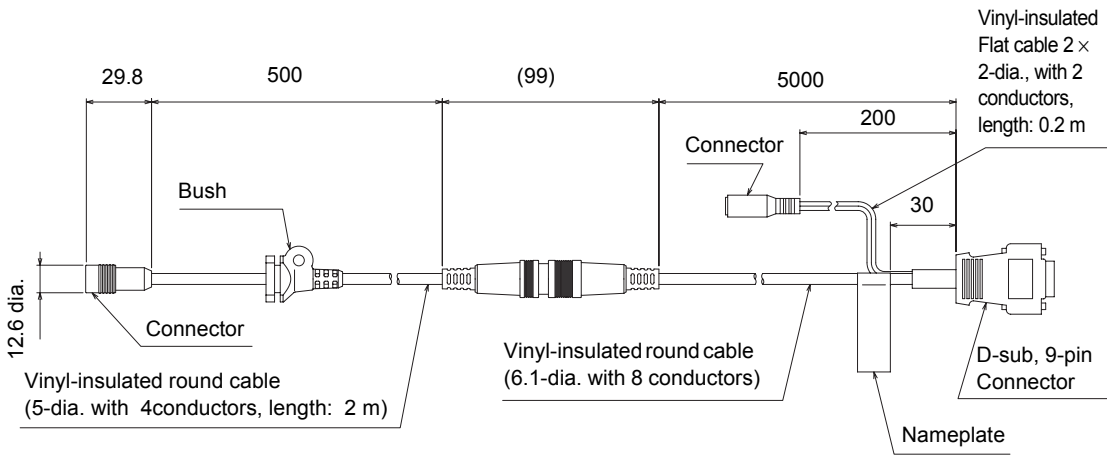
■ V400-W22-2M

(Unit: mm)



■ V400-W22-5M

(Unit: mm)

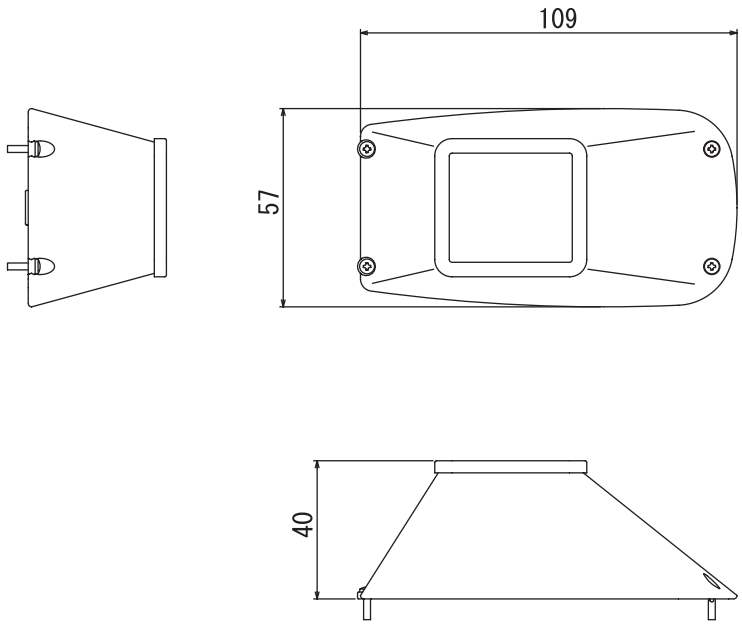


	V400-W22-2M	V400-W22-5M
Interface connector	D-sub, 9-pin, female	
Ambient temperature	Operating: 0 to 40°C Storage: -25 to 60°C	
Ambient humidity	35 % to 85 % (with no condensation)	
Ambient environment	No corrosive gases	
Materials	Cable sheath: Heat-resistant vinyl chloride Special connector: PPS, PBT, POM D-sub connector: ABS	
Minimum bending radius	30 mm	
Weight	Approx. 110g	Approx. 350 g

Contactor

■ V400-AC2

(Unit: mm)

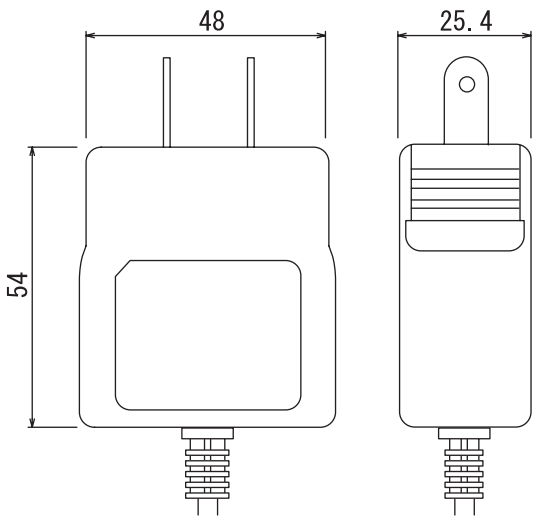


	V400-AC2
Materials	PC (transparent) The tip is made of silicon rubber (anti-static)
Weight	Approx. 20 g

AC adapter

■ V600-A22

(Unit: mm)



ASCII Table

Data read with no-protocol commands using the serial communications interface is output as 2 characters of ASCII.
The ASCII characters correspond to the following characters.

Examples:

- When the read data is A, 41 is output.
- When the data read is T, 54 is output.

Upper 4 bits

Lower 4 bits	0	1	2	3	4	5	6	7
0		DE		0	@	P	`	p
1	SH	D1	!	1	A	Q	a	q
2	SX	D2	”	2	B	R	b	r
3	EX	D3	#	3	C	S	c	s
4	ET	D4	$	4	D	T	d	t
5	EQ	NK	%	5	E	U	e	u
6	AK	SN	&	6	F	V	f	v
7	BL	EB	’	7	G	W	g	w
8	BS	CN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SB	*	:	J	Z	j	z
B	HM	EC	+	;	K	[	k	{
C	CL	→	,	<	L	¥	l	¦
D	CR	←	-	=	M	]	m	}
E	SO	↓	.	>	N	^	n	~
F	SI	↑	/	?	O	_	o	

FCS Calculation Method

■ FCS Calculation Method

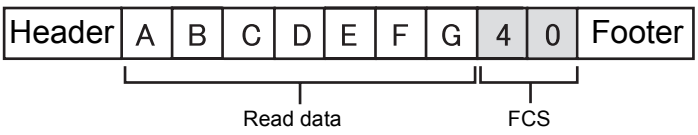
The FCS (Frame Check Sequence) is the result of taking the XOR for each byte between the header and footer (8 bits) and converting it to 2 characters of ASCII.
The FCS can be attached to output data to improve the reliability of communications.
Each time data is received, the host calculates the FCS and checks it against the FCS attached to the sent data so that the send data can be checked for errors.

■ Calculation Example for Sending FCS

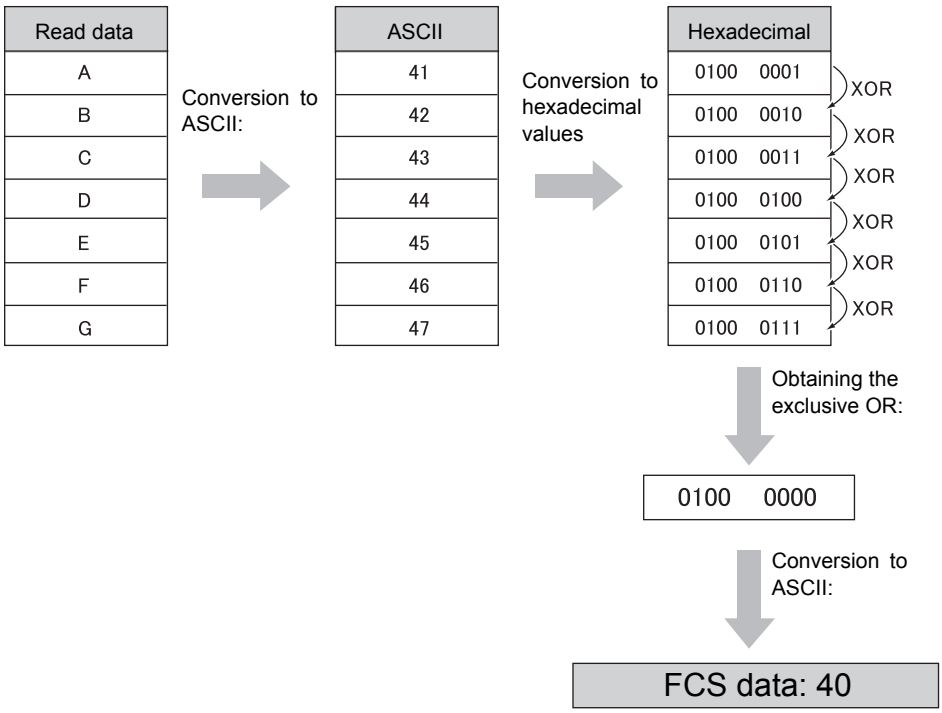
Sample read data: ABCDEFG

The details of the read data and calculation method are as follows:

- Read data



- Calculation method



■ Calculation Programming Example for Sending FCS

DATA$	Sample data string
L	Data length
CODE$	Data character
A	Exclusive OR

```
100     '* * * * * CALCULATE FCS * * * * *
110     '* FCSSET
120     L=LEN(DATA$)
130     A=0
140     FOR J=1 TO L
150     CODE$=MID$(DATA$,J,1)
160     A=ASC(CODE$)XOR A
170     NEXT J
180     FCS$=HEX$(A)
190     IF LEN(FCS$)=1 THEN FCS$="0"+FCS$
200     RETURN
```

■ FCS Check Subroutine Example for Received Data

```
1000    '* * * * * FCSHECK * * * * *
1010    '* FCSHECK
1020    Q=0:FCSCK$="OK"
1030    PRINT RESPONSE $
1040    LENGS=LEN(RESPONSE$)-3
1050    FCSP$=MID$(RESPONSE$,LENGS+1,2)                    'FCS in response data
1060    FOR J=1 TO LENGS                                   'Calculation range of FCS
1070    Q=ASC(MID$(RESPONSE$,J,1))XOR Q
1080    NEXT J
1090    FCSD$=HEX$(Q)
1100    IF LEN(FCSD$)=1 THEN FCSD$="0"+FCSD$               'FCS calculated in a program
1110    IF FCSD$ < > FCSP$ THEN FCSCK$="ERR"
1120    PRINT "FCSD$=";FCSD$;"FCSP$=";FCSP$;               'FCS received correctly: OK
                                  "FCSCK$=";"FCSCK$="      'FCS not received correctly:
                                                           ERR
1130    RETURN
```

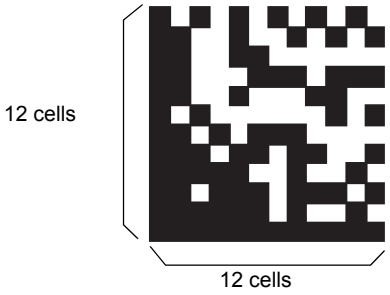
Data Capacity Tables

The maximum quantity of information that can be stored depends on the symbol size of the code. Also the maximum data capacity in relation to the amount of information carried by the code depends on the character type and the arrangement and combination of characters. The relation between the symbol size (number of cells) and data capacity is shown in the following table.

■ DataMatrix

◆ DataMatrix ECC200

In the following diagram, the symbol size is 12 × 12.

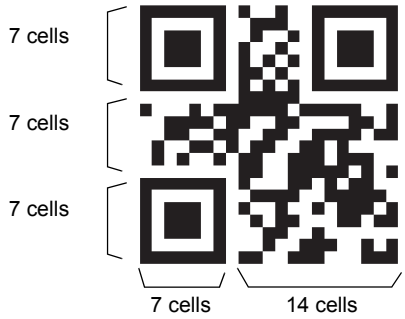


Symbol size	Data capacity				
	Numerals	Alphanumerics	Alphanumerics and symbols	2-byte characters	1-byte Japanese characters
10 × 10	6	3	3	-	1
12 × 12	10	6	5	1	3
14 × 14	16	10	9	3	6
16 × 16	24	16	14	5	10
18 × 18	36	25	22	8	16
20 × 20	44	31	28	10	20
22 × 22	60	43	38	14	28
24 × 24	72	52	46	17	34
26 × 26	88	64	57	21	42
32 × 32	124	91	81	30	60
36 × 36	172	127	113	42	84
40 × 40	228	169	150	56	112
44 × 44	288	214	190	72	142
48 × 48	348	259	230	86	172
52 × 52	408	304	270	101	202
64 × 64	560	418	372	139	278
8 × 18	10	6	5	1	3
8 × 32	20	13	12	4	8
12 × 26	32	22	20	7	14
12 × 36	44	31	28	10	20
16 × 36	64	46	41	15	30
16 × 48	98	72	64	23	47

■ QR Code

◆ QR Code (Model 2)

In the following diagram, the symbol size is 21 × 21 (Version 1).



Symbol size (version)	Error correction level (ECC level)	Data capacity			
		Numerals	Alphanumerics (uppercase)	8-bit bytes Byte	Japanese characters
21 × 21 (Version 1)	L (7%)	41	25	17	10
	M (15%)	34	20	14	8
	Q (25%)	27	16	11	7
	H (30%)	17	10	7	4
25 × 25 (Version 2)	L (7%)	77	47	32	20
	M (15%)	63	38	26	16
	Q (25%)	48	29	20	12
	H (30%)	34	20	14	8
29 × 29 (Version 3)	L (7%)	127	77	53	32
	M (15%)	101	61	42	26
	Q (25%)	77	47	32	20
	H (30%)	58	35	24	15
33 × 33 (Version 4)	L (7%)	187	114	78	48
	M (15%)	149	90	62	38
	Q (25%)	111	67	46	28
	H (30%)	82	50	34	21
37 × 37 (Version 5)	L (7%)	255	154	106	65
	M (15%)	202	122	84	52
	Q (25%)	144	87	60	37
	H (30%)	106	64	44	27
41 × 41 (Version 6)	L (7%)	322	195	134	82
	M (15%)	255	154	106	65
	Q (25%)	178	108	74	45
	H (30%)	139	84	58	36

Symbol size (version)	Error correction level (ECC level)	Data capacity			
		Numerals	Alphanumerics (uppercase)	8-bit bytes Byte	Japanese characters
45 × 45 (Version 7)	L (7%)	370	224	154	95
	M (15%)	293	178	122	75
	Q (25%)	207	125	86	53
	H (30%)	154	93	64	39
49 × 49 (Version 8)	L (7%)	461	279	192	118
	M (15%)	365	221	152	93
	Q (25%)	259	157	108	66
	H (30%)	202	122	84	52
53 × 53 (Version 9)	L (7%)	552	335	230	141
	M (15%)	432	262	180	111
	Q (25%)	312	189	130	80
	H (30%)	235	143	98	60
57 × 57 (Version 10)	L (7%)	652	395	271	167
	M (15%)	513	311	213	131
	Q (25%)	364	221	151	93
	H (30%)	288	174	119	74

Source: 2D Codes, Basic Specifications for QR Code (JIS X 0510)

Maximum Data Capacity

Even with the same 2D code, the maximum quantity of information that can be stored depends on the symbol size of the code.

In other words, the symbol size must be increased to increase the data capacity.

The data capacity also depends on the type of characters used for the information contained in the code. With QR and DataMatrix Code, the maximum number of characters for the same symbol size will be greatest for numbers only and then for alphanumerics, and will be the least with 2-byte characters.

The data capacity also depends on the character type, and the order and combination of characters used.

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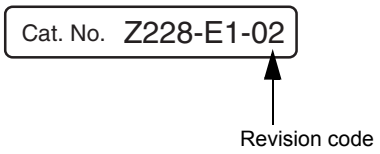
Revision History

A manual revision code appears as a suffix to the catalog number at the bottom of the front and back covers.



Revision code	Date	Revised contents
01	July 2005	Original production
02	March 2007	Changed information on Dimensions page, and added a note about 2-dimensional code margins.

MEMO

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